Essays on Social Capital and State Capacity: Tracing the Origins of the Welfare States

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Abstract

The focus in this Thesis is the endogenous formation of political institutions and their impact on public good provision and property rights protection.

In the first paper of this Thesis (Chapter 2), I study the effect of form of government on government policy in elections with a small margin of exceeding a threshold. I propose an identification strategy that is suitable for the implementation of a sharp regression discontinuity design for all possible types of pure and mixed proportional electoral systems used in 82 countries. To illustrate the implementation of this identification strategy, I use electoral, census and public finances data from Spanish municipalities in the autonomous region of the Basque Country. I present causal evidence suggesting that form of government induces a budget electoral cycle in components of per capita expenditure that are visible to the voters and classifiable as local public goods (e.g. road surfacing, water and sewage systems). Relative to coalition governments, single party governments increase the shares of capital outlays and tangible investment to the total budget by additional 14 % and 20 % respectively. These effects are more pronounced - 16 % and 31 % respectively - if evidence is drawn exclusively from ethnically mixed municipalities, in which each of the two main ethnic groups is represented by a separate set of political parties.

In the second paper of this Thesis (Chapter 3), I present evidence that households contribute more to local public goods in the presence of a community organization based on cross-sectional survey data from low-income neighbourhoods of Quito, Ecuador. The observed differences in household contributions are attributed to the ability of a community organization to coercively induce households to commit their time to community projects. This coercive power is argued to have origins associated with the formation of a neighbourhood as an illegal settlement. This coercive power is also suggested to have been a by-product of households voluntarily contributing to the organization in return for protection against government eviction. Locations with specific geographic characteristics served
an important role in providing natural protection and also in legally qualifying the organization to seek a global title over the invaded land. Using exogenous variation in these geographic characteristics, I find that the presence of a community organization has a positive effect on household time contributions to two public goods: trash collection in public areas (50 %) and community patrolling (176 %).

In the third paper of this Thesis (Chapter 4), I develop an occupational choice model with open-rule legislative bargaining to determine the conditions allowing for poor property rights to arise in a democratic equilibrium and to also demonstrate that their presence leads to inefficient outcomes. The necessary conditions emerge when each rich agent self-selects as an entrepreneur for a positive theft rate. The equilibrium occupational shares determine the necessity for coalition formation in the legislature, where the endogenously determined status-quo theft rate is subject to revision. A minimum winning coalition favouring a higher theft rate up to a threshold value, at which each rich agent is just willing to be an entrepreneur who hires workers, provide the sufficient conditions. The equilibrium is inefficient because a positive equilibrium theft rate reduces implies that not all of endowment is invested in the most productive process. The majority in this society, the ex-ante identical poor agents, also end up being ex-post identical but their most preferred theft rate is higher relative to the equilibrium theft rate. This result arises because the poor agents end up being represented by two political parties, neither of which has the majority in the legislature. I use a motivating example of a politically-organized land invasion to argue the model’s assumptions are plausible and to also motivate why an outcome of partial stealing and no evictions emerges in equilibrium.
To my parents, Snezhana and Ventsislav, for their outstanding support throughout my PhD studies.
“The man who moves a mountain begins by carrying away small stones. ”

— Confucius
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All omissions and mistakes are my own.
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Chapter 1

Introduction

The unifying theme of the chapters in this Thesis is the endogenous formation of political institutions to support the provision of public goods and property rights enforcement. Using applied microeconometric policy evaluation methods and applied microeconomic models, I seek to obtain better understanding of the causal mechanisms that shape these institutions.

The undertaking of the chapters in this thesis were rooted in understanding the historical emergence of welfare states. This remains a long-term objective of my research agenda but early in my doctoral studies I was convinced that to achieve it I needed to focus my attention to the foundations of welfare states the many underlying institutions that support it and require further investigation in their own right. A main focus of my research is how the existing electoral rules give rise to endogenous political institutions, through which they influence government policy. To address a subgroup of such questions, I exploit the institutional setup of electoral systems and align it to the properties of a specific policy evaluation empirical strategy. For instance, in Chapter 2 of this Thesis I exploit the institutional setup of proportional electoral systems to construct a valid assignment variable suitable for the implementation of a sharp regression design in studying questions related to form of government. Because this assignment variable is a function of the electoral rules (e.g. legislature size) and in addition only those observations close to the threshold can experience a switch in the form of government, I can estimate the economic effect of an electoral reform through the form of government.

In addition, the research that is part of this Thesis also concentrates on issues related to development economics as developing countries are more likely to exhibit fledgling features of public good provision and redistributive policies, features that are likely to trace the
institutions leading to the formation of more comprehensive in scope welfare states. In a broader sense, these fledgling institutions we associate with the emergence of state capacity. A key emphasis in this research is paid to how different forms of heterogeneity shape the institutions that have an impact on public good outcomes. In Chapter 3 of this Thesis, I study the process of transforming social capital into coercive power, which I argue is essential for the formation of an informal tax base. Similarly, in Chapter 2 of this Thesis, I investigate the role of form of government as a power sharing institutions across ethnic groups that influence the size and variation of public good provision in ethnically mixed municipalities.

In Chapter 4 of this Thesis, I investigate the formation of political institutions that foster the emergence of poor property rights protection. These political institutions are shown in this Chapter of the Thesis to allow for a portion of the assets to be stolen and later legitimized by the country’s legislative body. This result could serve to explain two key aspects of the formation of squatter settlements in medium-sized and large cities in the developing world: the unlawful seizure of a fraction of available land and the absence of restoration of property rights to the original owners. This result is driven on the one hand by the interactions of three occupation groups in a labour market and of their political representatives in the legislature on the other. From the perspective of the broad objectives of this thesis, the process of legitimizing the stealing of assets could be viewed as a redistributive policy from the relatively rich agents to the poor. Chapter 4 of this Thesis shows that a limit to this redistributive policy is the political representation of the ex-ante identical poor agents by two separate political parties due to their self-selection into two different occupational groups.

To sum up, this Thesis investigates the formation of endogenous political institutions that impact two essential components of welfare states: public good provision and income redistribution.
Chapter 2

Re-election Concerns and Spending Decisions

2.1 Introduction

The prevailing form of government - single party government as opposed to coalition government - in parliamentary democracies could have important implications on the size of government as well as in inducing variation in government spending over the span of the electoral cycle. Persson, Rolland and Tabellini (2007) - hereafter PRT - argue that, relative to single party governments, coalition governments engage in higher spending because they have to appeal to distinct groups of voters. At the same time, the electoral budget cycle literature has been plagued with conflicting evidence whether electoral budget cycles, i.e. variation in government expenditure over the span of the electoral cycle, indeed exist (Schneider, 2010). This conflicting evidence points to the possibility that another factor such as the relative frequency of one form of government over another could be influencing the likelihood of detecting an effect. The importance of form of government on government policy is rooted in the (in)ability of a single political party to control the majority of the parliamentary seats, the possession of which in parliamentary democracies is key to passing legislation and to exercising control over the executive branch. The ability of a single party to command the majority of the parliamentary seats also determines whether we observe single party governments, requiring the parliamentary support of a single political party, or coalition governments, requiring the support of at least two parties.

The objectives of this paper are both methodological and empirical in nature. The first
methodological objective is to develop an identification strategy suitable for implementing a sharp regression discontinuity design - hereafter RD design - for the entire range of pure and mixed proportional electoral systems used in 82 countries. Drawing causal inference from closely contested elections has the compelling advantage of exploiting the quasi-randomness around an observed threshold, which in my context would serve to grant a single party the majority of the parliamentary seats. By using exogenous variation in the d’Hondt method of translating vote shares into parliamentary seats, I construct an assignment variable that achieves perfect compliance with respect to the treatment status, i.e. form of government, which makes possible the implementation of a sharp RD resign. This provides greater credibility to the estimates because no behavioural assumptions have to be made on how the assignment variable affects the treatment status. My method overcomes the limitations observed in the data (e.g. share of the popular vote, share of seats) due to their inability to capture the institutional setup of proportional electoral systems and/or to satisfy the technical requirements of a RD design under general conditions.

Regression discontinuity design has the advantage of drawing causal inference from the subset of closely contested elections, where the re-election incentive is likely to be the strongest. In addition, RDD allows on each side of the threshold to include observations that have had both coalition as well as single party governments in preceding electoral cycles. These two features provide it with an advantage over other empirical methods in assessing the impact of re-election behaviour on government expenditure outcomes. For instance, difference-in-difference estimation and instrumental variable estimation use observations with both close and non-close elections. Their estimates might be noisier as those observations from non-close elections may not be responsive to re-election concerns.

The second methodological objective is to use the properties of the constructed assignment variable to estimate the economic effect of an electoral reform through the form of government. This is achieved for two reasons: First, the constructed assignment variable indicates whether there is a switch in the form of government in response to a change in an electoral rule (e.g. legislature size, electoral threshold, the number of seats legally granted to the largest political party, and the number of seats allocated under non-proportional rules in mixed proportional electoral systems). Secondly, I formally find conditions, indicating that only those observations in proximity to the threshold of the assignment variable can experience a switch in the form of government. With this property in place, an RD design can be used to compute the economic effect of a change in an electoral rule through
CHAPTER 2. RE-ELECTION CONCERNS AND SPENDING DECISIONS

the form of government because of its predictive power at the threshold of the assignment variable. Importantly, this property of the identification strategy could be applied not only to electoral rules specific to pure proportional systems (e.g. raising the electoral threshold) but also for studying the change of an electoral system from relatively more majoritarian to relatively more proportional or vice versa (e.g. increasing the number of seats allocated under proportional electoral rules).

The empirical objectives of this paper are to provide causal evidence from the proposed identification strategy to two main research questions: How does the form of government affect - (i) the size of government and (ii) the variation in government spending - over the span of the electoral cycle under proportional electoral rules? The first question is based on the already noted theoretical prediction of PRT. In contrast, the second question is based on the idea that incumbent governments increase spending on visible to the voter items in the pre-election period in order to portray themselves as competent and thus increase their likelihood of being re-elected. One possibility is that the re-elections concerns of the incumbents propping up a coalition government but not in a single party government may clash and this difference may generate a different spending pattern between the two forms of government in pre-election years. Last but not least, I use the obtained results to estimate the \textit{ex ante} economic effect of an electoral reform that would see the size of Spanish municipal councils slashed in 2015.

To illustrate the implementation of the proposed identification strategy and to provide evidence to these two research questions, I use municipal-level panel data from the autonomous community of the Basque Country, one of the 17 regions of Spain. To compile this dataset, I use electoral data from four electoral cycles combined with census data and government finance data. A particular strength of this dataset is the presence of a large proportion of elections with a small margin of exceeding a threshold. This allows for utilizing the internal validity of RD design as approximately 20% of all observations lie within 2% of the threshold of the assignment variable. From an institutional standpoint, it is constitutionally infeasible for endogenous electoral cycles to arise - there are fixed-term elections that take place simultaneously with no legal possibility for calling early elections. Furthermore, there is no possibility of divided government as the mayor is elected by the municipal council. Last but not least, the observations with closely contested elections arise in predominantly ethnically mixed municipalities, in which each of the two main ethnic groups is represented by a separate set of political parties. In this context, form of government could
point to the salience of the distribution of political power across ethnic groups as a coalition government may be propped up by political parties representing both ethnic groups. To provide greater credibility to this interpretation, I use an institutional constraint implied by the proportional electoral rules to include only those observations, in which both main ethnic groups can feasibly be politically represented.

The first major finding is that form of government generates an electoral budget cycle in the composition of spending that is captured by the smaller increases in government expenditure on local public goods by coalition governments relative to single party governments in pre-election years. This effect is detected in the differences between the two forms of government in the annual percentage changes of the shares of capital outlays and tangible investment respectively to total expenditure in pre-election years. The estimated gaps between coalition and single party governments for capital outlays (tangible investment) measured at the threshold is \(-14\%\) \((-20\%\)). Importantly, these magnitudes are driven by two forces observed at the threshold: an increase of each of these shares for single party governments and a corresponding decrease for coalition governments. This result is possibly driven by a conflict in a coalition government over increasing the probability of each coalition partner being re-elected in office. A senior coalition partner may want to increase government expenditure on local public goods to increase the probability of a single party government, while a junior coalition partner may have an incentive to do the reverse. This is because a junior coalition partner faces a trade-off between increasing its vote share and increasing the probability of participating in a coalition government in the following electoral cycle.

These estimated baseline estimates are of the same sign but larger, \(-16\%\) \((-31\%\)), when the sample is restricted to only ethnically mixed municipalities based on the institutional constraint implied by the pure proportional electoral rules. I also find a large in magnitude but noisy under some specifications effect on total expenditure per capita. The estimated gap in the increases to per capita total expenditure between single party governments and coalition governments measured at the threshold of the assignment variable is \(-21\%\). There are two possible reasons why an effect is being detected in the components of spending under virtually all specifications but not in total expenditure. Drazen and Eslava (2005, 2010) advance the argument that government may target certain components of government spending as a second-best strategy in manipulating the electorate into their competence. This could be due to sophisticated voters who would foresee the manipulation in total
expenditure but not in its composition (Drazen and Eslava, 2005 and 2010) or due to the presence of the institutional constraints or limited fiscal autonomy (Schneider, 2010). The more pronounced results in the ethnically mixed municipalities could highlight the salience of power sharing across ethnic groups as an extra check and balance in exercising control over government expenditure in pre-election years.

In contrast, I find no detectable effect in government spending between single party governments and coalition governments over the entire electoral cycle for the subset of elections with close margin of exceeding a threshold. In addition, the estimated coefficient (-7%), albeit noisy and unstable, would under various specifications measure that coalition governments spend less than single party governments. Together, these two pieces of evidence pose a serious challenge to the theoretical prediction of PRT that coalition governments would engage in higher spending in order to be re-elected. The absence of a detectable effect is also at odds with the finding that coalition governments represent a larger constituency at the threshold of the assignment variable, a difference that is statistically significant. A notable strength of drawing causal inference from this data is the reliance on the randomness of being on either side of the assignment variable and the fact that all observations are subnational units facing identical political and legal institutions.

I also find no evidence from simulations that a council size reduction is likely to result in more frequent formation of one from of government over another. A second set of simulations reveal that a reduction in legislature size raises by 4.28% the effective threshold required for representation in small-sized legislatures. This effect could potentially lead to a behavioural response among voters and political parties that favours the more frequent formation of single party governments.

My method differs notably in two respects from what has already been achieved in the literature on electoral competition drawn from closely contested elections. In my method, I extend the idea of drawing causal inference from closely contested elections to settings with an arbitrary number of political parties that markedly differs from the two-party/two-candidate majoritarian electoral systems primarily applied to US elections (Albouy, 2008 and 2009, Lee, 2001 and 2008, Lee, Moretti and Butler, 2004, McCrary, 2008), presidential-type systems with a legally set threshold for a winner to be declared (Brollo and Troiano, 2012) and two groupings with opposite interests on a single-dimensional issue (Pettersson-Lidbom, 2008). In addition, my method could be applied to mixed electoral systems as opposed to pure electoral systems (e.g. pure majoritarian, pure presidential).
Secondly, my method provides for assessing the economic effect of an electoral reform through form of government. This property allows to directly test the prediction of PRT that electoral rules indeed affect government policy through form of government. The benefit of my approach relative to measuring the direct effect of an electoral rule, such as the legislature size, on government policy (Petterson-Lidbom, 2006) is that it links a change in the legislature size to the distribution of political power. This distinction is important because in parliamentary democracies, usually characterized by strong party discipline, legislature size could be argued to matter because of its effect on the (in)ability of a single political party to command the majority of the parliamentary seats.

This paper is also the first to find to the best of my knowledge that form of government induces an electoral budget cycle. This paper joins recent work in attempting to uncover the institutional forces that induce a budget electoral cycle (Schneider, 2010) that I extend to the form of government. In this respect my paper may shed further light on an existing debate why electoral budget cycles arise in some instances (Tuft 1978; Alesina and Roubini 1992; Franzese 2002b, Alesina et al. 1992 and 1997; Shi and Svensson 2006; Persson and Tabellini 2003a) but not in others or instead take different previously unexplored forms (Brender and Drazen 2005; Joehimsen and Nuscheler 2005; De Haan and Sturm 1994; Drazen and Eslava 2005; Seitz 2000).

Last but not least, this paper also aims to contribute to the literature that studies the relationship between ethnic fractionalization and public good provision. It does so by emphasizing that formal political institutions could serve as a power sharing institution across ethnic groups that influences government policy. These results, alongside the new identification strategy used in this paper, are directly applicable to at least 12 European countries that use proportional electoral rules and in which coalition governments are frequently made up of political parties representing minority ethnic groups. This niche has been previously unexplored as the existing empirical evidence is primarily drawn from settings in US cities and developing countries without noting the salience of the distribution of political power among ethnic groups (Alesina, Baqir and Hoxby, 2004, Alesina, Baqir and Easterly, 1999).

This paper is organized as follows. I provide a detailed institutional background of pure and mixed proportional electoral systems in Section 2. In section 3, I propose an identification suitable for the implementation of a RD design in questions related to form of government in these electoral systems. In section 4, I describe the empirical strategy, the data, the institutional setting of the Spanish electoral system and Spanish fiscal federalism
and in addition I provide descriptive statistics. In Sections 5, I present the baseline results and provide several robustness checks. In Section 6, I provide a methodological exposition of an electoral reform and estimate the economic affect of reducing municipal council size that would be implemented across Spanish municipalities in 2015. Finally, I offer some concluding remarks.

2.2 Institutional Setting

2.2.1 Electoral Systems of Proportional Representation: Overview

Electoral systems of proportional representation are used in 82 countries at the national and/or the subnational level, including 23 of the 28 member states of the European Union. The party list is emblematic to proportional electoral systems as running several candidates, as opposed to one, in a multi-seat constituency helps achieve the relatively proportional translation of votes into parliamentary seats, at least when compared to majoritarian (first-past-the-post) electoral systems. The proportionality of these electoral systems stems from the ability of a political party to earn a share of seats from a multi-seat constituency on the basis on its overall vote share. In electoral systems of proportional representation, each political party runs an ordered list of candidates, i.e. a party list, in a multi-seat constituency. If a political party based on its electoral performance receives \( x \) number of parliamentary seats, the first \( x \) number of candidates in the party list are considered elected. The ability (inability) of voters to alter the order of candidates in the party lists gives rise to open (closed) party lists. In closed party lists, the order of candidates is determined by the leadership of the respective political party. In open party lists, voters can influence the ordering of the candidates in the party list. Mixed proportional electoral systems are characterized by electing a share of the members of parliament under proportional electoral rules and the remaining share under other (e.g. majoritarian) electoral rules.

Proportional electoral systems use either a highest average (HA) or a largest remainder (LR) method to translate political parties’ votes shares into parliamentary seats. In this section, I describe the allocation process of parliament seats for the subset of highest average methods and leave the corresponding description for the subset of largest remainder methods to Appendix A1.

The highest average methods use scores, which are derived from dividing the vote share of each political party, measured as a percentage of the popular vote, by a sequence of divisors.
The total number of divisors in the sequence is equal to the total number of seats, $N$, in the legislature. In a constituency with $P$ number of participating political parties, the total number of scores equals $NP$. The highest ranked $N$ scores would grant the corresponding political parties seats in the legislature, while the remaining $N(1-P)$ scores would not. By far, the most widely used highest average methods are the d’Hondt method and the St. Lague method. Other highest average methods include the methods of the Modified St. Lague, the Hungarian St. Lague, and the Imperiali divisors as well as the Danish method. The single distinction between these methods is the use of a different sequence of numbers as divisors, which is illustrated in Table C.1. To illustrate the allocation process of votes into parliamentary seats for highest average methods, I provide a numerical example.

**Example 1:** Suppose that there are 4 political parties named $(A, B, C, D)$ that have received a positive number of voters - $A = 42\%$, $B = 32\%$, $C = 15\%$, and Party D = 11\% - in a multi-seat constituency of 5 seats. The electoral system uses the d’Hondt method to translate vote shares into parliamentary seats. According to Table C.1, the vote share of each political party is divided by the members of the sequence $\{1, 2, 3, 4, 5\}$. Each of the resulting numbers is termed a score, whose relative ranking determines whether a score elects a seat to its respective political party. In this example, there are 5 parliamentary seats to be allocated and the five highest-ranked scores are granted a parliamentary seat, while the remaining scores are not. In the final step, I count the number of scores qualifying for a seat for each political party. This allocation process is being illustrated in Table C.2.

There are several commonly observed electoral rules specific to proportional electoral systems that could distort the pure proportional translation of vote shares into parliamentary seats. These institutional factors include the size of the legislature, a minimum legal threshold required for representation and a legally determined number of bonus seats awarded to the largest political party. The size of the legislature could lead to distortions in the proportional translation of a vote share into a seats share because the share of parliamentary seats is a discrete variable, while the share of the popular vote is a continuous variable. As the size of the legislature becomes smaller, the seat share becomes more crudely measured. Thus, the potential for a distortion in the pure proportional translation of vote shares into parliamentary seats increases.

Proportional representation are also characterized by the presence of an electoral threshold. It ranges from 0.67\% in the Netherlands to 10\% in Turkey (Moser, 2012). The role of such legal threshold is to leave political parties that obtain too small share of the popular
vote ineligible for parliamentary seats. In the d’Hondt method, those political parties that obtain a share of the popular vote below a minimum legal threshold are being disqualified from the competition for parliamentary seats by not being assigned scores. This property of the d’Hondt method is being illustrated in the example below.

**Example 1 (revisited):** Consider again the same example with the four political parties \((A, B, C, D)\) with the same vote share distribution in a riding of 5 seats. In addition, suppose that the electoral threshold is 20%. This electoral threshold implies that Party C and Party D are ineligible for parliamentary seats. To disqualify these party from the allocation of parliamentary seats, the d’Hondt method does not assign scores derived from their vote share to either Party C or Party D. This implies that only the scores of Party A and Party B, which meet the legal threshold requirement of 20% are being ranked in determining the parliamentary seat allocation. This property of the d’Hondt method is illustrated in Table C.3.

Another institutional peculiarity of some electoral systems of proportional representation, such as those used in Italy and Greece, is awarding the largest political party a legally set number of bonus seats. The main rationale for the use of bonus number of seats is to increase the likelihood for the formation of a single party government without leaving smaller political parties without representation in the legislature. This rule achieves this objective by decreasing to less than a half the share of seats that the largest party needs to earn from the pools of seats allocated based on a highest average or a largest remainder method.

### 2.3 Methodology

#### 2.3.1 Pure Proportional Electoral Systems

In this section, I formally propose an identification strategy suitable for implementing a sharp RD design in studying questions related to form of government for all possible types of pure and mixed proportional electoral systems. I also show that my method is applicable to an arbitrary number of political parties, arbitrary-sized legislature, an arbitrary initial seat allocation as well as the presence of electoral rules such as the minimum legal requirement for representation or legal number of bonus seats granted to the largest political party.

My method exploits exogenous variation in the d’Hondt method, or any other HA or LR method, to construct an assignment variable that measures the minimum transfer of
the popular vote and achieves perfect compliance with respect to the treatment status, i.e. form of government. In this sense, my method is closely related to Folke (2013) as it uses the same assignment variable, i.e. minimum transfer of vote shares, that uniquely identifies the political parties involved in the transfer.\footnote{Another method by Freier and Odendahl (2012) measures the proximity of an observation to losing a seat by the frequency in the seat change in response to perturbations of the overall popular vote. The main limitation of their approach is that it does not capture the institutional setup of proportional electoral rules in inducing these perturbations. As a result, the proximity of a larger number of political parties to losing a seat is likely to generate more frequent change in seats.} My method, however, allows for an arbitrary initial seat allocation, which is an important consideration for generating a non-biased sample of elections with a small margin of exceeding a threshold. This is the case because I show that the assignment variable depends on the size of the legislature, the vote share distribution and the minimum legal requirement for representation. In addition, my method is robust to the inclusion of different-sized legislatures, where one seat represents a different share to the number of total seats.

For the proportional electoral systems, in general, an observed in the data variable cannot serve as an assignment variable under general conditions. For instance, the number of parliamentary seats is not an appropriate candidate for an assignment variable because it would not satisfy the technical requirements of positive density at the threshold for small-sized legislatures and in addition its values would not be comparable for different-sized legislatures. Using instead the share of the popular vote could be even more problematic as there does not exist a unique threshold of the popular vote that would grant a single party the majority of the parliamentary seats in the legislature. This issue is partly driven by the presence of a legal threshold required for representation or a small-sized legislature that could lead to the distortion of the proportional translation of votes into parliamentary seats. Furthermore, the chosen sequence of divisors in a highest average method may also favour granting more seats to larger political parties relative to their vote share or vice versa.

Next, I proceed to formally constructing an assignment variable suitable for the implementation of a sharp RD design. A valid sharp RD design requires that the treatment status is a deterministic step-function of an observed assignment variable $X$. That is, $D = 1$ if and only if $X$ crosses the discontinuity threshold. Such a discontinuous rule can be described as:

\[ D_{1}: \text{(Discontinuous rule)} \quad D = 1 \text{ iff } X > 0 \]  
This implies that the equation governing the latent propensity of treatment is becomes $P^*=p^*(Z,U) = Pr(X > 0 | Z,U)$, where $Z$ is a
vector of observed characteristics and $U$ is a vector of unobserved characteristics.

D2: The assignment variable $X$ is observed.

In the context of this paper, an assignment variable $X$ is such that it leaves all instances, in which a single party commands the majority of seats in the legislatures above a threshold value, and all instances, in which a single party does not command the majority of seats in the legislature below the same threshold value. I show that this property of the assignment variable is not violated due to the presence of any of the following institutional factors - size of the legislature, minimum legal threshold required for representation, bonus number of seats awarded to the largest party. In addition, the assignment variable is constructed such that its values are comparable if obtained from legislatures of different size.

Let $(v_1, v_2, ..., v_P | \sum_p v_p = 100, 0 \leq v_p \leq 100)$ be the distribution of vote shares of political parties $(\alpha_1, \alpha_2, ..., \alpha_P)$ in a multi-seat constituency of size $N$, where $N$ is a positive integer. W.l.o.g., I assume that $v_1 \geq v_2 \geq ... \geq v_P$ and in addition that $N$ is odd. For the notational convenience in this section, let $\Omega$ be a short-hand notation for $(v_1, v_2, ..., v_P | \sum_p v_p = 100, 0 \leq v_p \leq 100)$. In addition, suppose that there is a legal threshold required for representation, denoted by $\gamma \in [0, 100]$, that must be met by party $\alpha_p \forall p$, i.e $v_p \geq \gamma$.

The size $N$ of the constituency implies that d'Hondt method uses the sequence of divisors $n \in \{1, 2, ..., N\}$ to derive the scores that are used to determine the allocation of parliamentary seats. From the total number of political parties $P$ and the size of the constituency $N$, it is immediately deduced that there are a total of $NP$ scores. Each of these scores $\frac{v_p}{n} \in [0, 100]$ receives a rank $r \in \{1, 2, ..., NP\}$ based on its magnitude relative to all other scores. The $N$-highest ranked scores $r \in \{1, 2, ..., N\}$ earn seats for their respective political parties as it has been described in section 2. The remaining scores $r \in \{N+1, N+2, ..., NP\}$ do not earn seats for their respective political parties.

For the methodological exposition of the argument in this section, the distribution of the vote shares of the political parties could be conveniently subdivided into two mutually exclusive subgroups: $(v_1, v_1; \alpha_1, \alpha_1 | N, \Omega, \gamma)$, where $v_1 = 100 - v_1$. These two subgroups are associated with the largest political party $\alpha_1$ and its complement, i.e. all political parties other than the largest political party $\alpha_1$, respectively.\footnote{If there is a tie for the largest share, one political party is randomly chosen as $\alpha_1$. The remaining political parties are placed in $\alpha_1$.} Similarly, the seat allocation generated by the d’Hondt method from the vote distribution $(v_1, v_1; \alpha_1, \alpha_1 | N, \Omega, \gamma)$ is given
by \((w, N - w; \alpha_1, \alpha_2 | N, \Omega, \gamma)\). In addition, scores are being ranked within each subgroup. Let \(r_1(\frac{v_1}{n})\) denote the rank of score \(\frac{v_1}{n}\) within the subset of scores belonging to \(\alpha_1\), and also let \(r_{-1}(\frac{v_1}{n})\) denote for the rank of score \(\frac{v_1}{n}\) within the subset of scores belonging to \(\alpha_2\).

A single party government arises whenever \(w \in \{\frac{N+1}{2}, \ldots, N\}\) and a coalition government - whenever \(w \in \{1, \ldots, \frac{N-1}{2}\}\). Let the pivotal seat distribution be \((\frac{N+1}{2}, \frac{N-1}{2}; \alpha_1, \alpha_2 | N, \Omega, \gamma)\).

**Definition** An assignment variable \(X\), defined as the solution to

\[
\frac{(v_1 + X)}{(N + 1)/2} = \frac{(\tilde{v}_1 - X)}{\tilde{n}},
\]

measures the minimum transfer in a vote share to \(\alpha_1\) from \(\tilde{\alpha}_1\) such that \(D = 1[X > 0]\) iff \(w < \frac{N+1}{2}\). For this transfer to be minimum, \(r_1(\frac{v_1 + X}{(N+1)/2}) = \frac{N+1}{2}\) and \(r_{-1}(\frac{\tilde{v}_1 - X}{\tilde{n}}) = \frac{N+1}{2}\)

where \(\tilde{n}\) is the corresponding divisor of the score \(\frac{\tilde{v}_1 - X}{\tilde{n}}\) that generates such rank.

The above definition implies that, after the transfer \(X\) is initiated, the \(\frac{N+1}{2}\) highest-ranked scores of \(\alpha_1\) are among the \(N\) highest-ranked scores of all political parties and, furthermore, \(r(\frac{v_1 + X}{(N+1)/2}) = N\), i.e. \(\frac{v_1 + X}{(N+1)/2}\) is the lowest-ranked score that grants any political party a parliamentary seat.

The threshold of the assignment variable \(X\) has the following interpretation: if an observation experiences a change from a negative value to zero, the largest political party acquires the pivotal \((N + 1)/2^{th}\) seat in a legislature of size \(N\), where \(N\) is odd. The acquisition of this pivotal seat allows for a single political party to pass legislation without seeking the support of other political parties.

**Proposition 1.** The treatment assignment indicating that a single political party commands the majority of the parliamentary seats occurs through a known and deterministic decision rule: \(D = 1[X > 0]\), i.e.

\[
X = \begin{cases} 
\text{non-positive} & : \text{iff } w \geq \frac{N+1}{2} \quad \text{(i.e. single party governments)} \\
\text{positive} & : \text{iff } w < \frac{N+1}{2} \quad \text{(i.e. coalition governments)},
\end{cases}
\]

where \(X\) is the solution to equation 2.1 given by:

\[
X = \frac{\tilde{n}(N + 1)/2}{\tilde{n} + (N + 1)/2} \left( \frac{\tilde{v}_1}{\tilde{n}} - \frac{v_1}{(N + 1)/2} \right),
\]

**Proof:**
Suppose that \( w \geq \frac{N+1}{2} \). I will show by construction that \( X \leq 0 \). The starting condition implies that \( \frac{v_1}{(N + 1)^2} \geq \frac{v_1}{w} \geq \frac{(\bar{V}_1-X)}{n} \). The first non-strict inequality \( \frac{v_1}{(N + 1)^2} \geq \frac{v_1}{w} \) follows directly from the assumption \( w \geq \frac{N+1}{2} \). The second non-strict inequality \( \frac{v_1}{w} \geq \frac{(\bar{V}_1-X)}{n} \) follows from \( r\left(\frac{v_1}{w}\right) \leq N \) and \( r\left(\frac{\bar{V}_1}{n}\right) > N \), which are together implied by the assumed allocation of seats \((w, N - w; \alpha_1, \alpha_1 | N, \Omega, Y)\) and \( w \geq \frac{N+1}{2} \). For the first and third term in the double inequality to be equalized, i.e. \( \frac{v_1 + X}{(N + 1)^2} = \frac{(\bar{V}_1 - X)}{n} \), it must be true that \( X \leq 0 \).

Suppose that \( X \leq 0 \), i.e. the required transfer to move from the original seat distribution \((w, N - w; \alpha_1, \alpha_1 | N, \Omega, Y)\) to \((\frac{N+1}{2}, \frac{N-1}{2}; \alpha_1, \alpha_1 | N, \hat{\Omega}, Y)\) is non-positive. I will show by contradiction that \( w \geq \frac{N+1}{2} \).

Suppose not, i.e. \( X > 0 \). A transfer \( X > 0 \) increases the vote share of \( \alpha_1 \) and correspondingly raises in value each of \( \alpha_1 \) scores \( \frac{v_1}{1}, ..., \frac{v_1}{N} \). Similarly, \( X > 0 \) decreases the vote share of \( \alpha_\perp \) and correspondingly lowers each of \( \alpha_\perp \)’s scores \( \frac{\bar{v}_1}{1}, ..., \frac{\bar{v}_1}{N} \). The scores of the remaining political parties remain unchanged. As a result, \( r\left(\frac{v_1}{n}\right) \forall n \) weakly decreases and \( r\left(\frac{\bar{v}_1}{n}\right) \forall n \) weakly increases, i.e. the only possible reversal in the score ranking runs in favour of \( \alpha_1 \) at the expense of the other political parties \( \alpha_\perp \). As a result, the seat count of \( \alpha_1 \) weakly increases relative to \( w \) and the seat count of all other political parties weakly increases relative to \( N - w \). This implies that \( w \leq \frac{N+1}{2} \). To rule out the possibility that \( w = \frac{N+1}{2} \), I use the fact that \( v_1 \) strictly increases for \( X > 0 \). This implies that if \( w = \frac{N+1}{2} \), after the transfer \( X \) were implemented the vote distribution is not at the tipping point of \( \alpha_1 \) losing the \( \frac{N+1}{2} \) seat. This establishes the contradiction.

The proof of the case \( w < \frac{N+1}{2} \) is analogous.

QED.

To illustrate how \( X \) is computed, I provide a numerical example.

**Example 1 (revisited):**

We know that \( N = 5 \), and \( w = 2 \). This implies that \( (N - w) = 3 \), i.e. all parties other than Party A command 3 seats in the legislature. Therefore, the pivotal seat allocation is \((3, 2; A; B + C + D)\). This implies that there must be initiated a transfer of one seat to Party A from one of Party B, Party C or Party D. To determine from which party the score is initiated, we must use the score from the subset of parties B, C, and D that generates a rank \( r_\perp\left(\frac{w}{n}\right) = 3 \), where \( \frac{N+1}{2} = 3 \). This score must be just exceeded by the score of the largest party that yields rank \( r_1\left(\frac{w}{n}\right) = 3 \).
42 + \frac{X}{3} = \frac{15 - X}{1} \tag{2.3}

This implies that:

\[ X = 0.75, \tag{2.4} \]

i.e if 0.75% of the popular vote were transferred from Party C to Party A, Party A be just sufficient to acquire the pivotal seat in the legislature.

Proposition 1 has the advantage to be easily extendable to all other highest average methods. This is the case because by changing the sequence of divisors we only affect the numerical value of each of the scores. All the remaining ingredients necessary to carry out the construction of the assignment variable remain intact. Proposition 1 can also be extended for an even-sized legislature, where the pivotal seat allocation becomes \((\frac{N}{2} + 1, \frac{N}{2} - 1; \alpha_1, \alpha_1 | N, \Omega, \chi)\).

Proposition 1 implies that the method proposed by Folke (2013) is a special case of my method when all observations are within one seat from the threshold of the assignment variable, i.e. \(w \in \{\frac{N-1}{2}, \frac{N+1}{2}\}\). His approach, however, suffers from the limitation that it is not generalized to an arbitrary number of seats away from the threshold of the assignment variable. Due to this limitation, his method may generate a bias in the inclusion of observations. Folke (2012) fails to take into account that the minimum transfer of the vote share is determined by \(N, \Omega\) and \(\chi\). For instance, for some distributions \(\Omega\) it is possible that an initial seat allocation \(w \notin \{\frac{N-1}{2}, \frac{N+1}{2}\}\) may generate a smaller value for the assignment variable \(X\) than for other distributions \(\Omega\), for which \(w \in \{\frac{N-1}{2}, \frac{N+1}{2}\}\). As a result, there is a potential bias in the inclusion of observations close to the threshold of the assignment variable \(X\) even if all observations in the sample have the same \(N\) and \(\chi\). A second source of bias is including observations with different \(N\) for \(w \in \{\frac{N-1}{2}, \frac{N+1}{2}\}\). A smaller \(N\) is likely to generate a greater potential range of \(X\) relative to a larger \(N\ ceteris paribus\) because one seat constitutes a different proportion of the legislature size \(N\).

### 2.3.2 Mixed Proportional Electoral Systems

The result from Proposition 1 could also be extended to mixed proportional electoral systems under some behavioural assumptions. Suppose that of the total \(N\) parliamentary seats, \(N - B\) are electoral under proportional electoral rules and the remaining \(B\) seats are allocated
under majoritarian or other non-proportional electoral rules. In addition, suppose that the allocation of these B seats among political parties is: 
\( (\alpha_1, \alpha_2, ..., \alpha_P) = (B_1, B_2, ..., B_P) \) such that 
\( B = \sum_p B_p \) and 
\( 0 \leq B_p \leq B \) \( \forall p \).

**Assumption 1.** The distribution of seats \( B \) elected under majoritarian rules remains unchanged when the vote share under proportional rules is transformed from \( \Omega \) to \( \hat{\Omega} \).

Assumption 1 is plausible because in mixed proportional systems, voters cast two ballots - one for a party list and another for majoritarian candidate.

**Assumption 2.** \( B_p < \frac{N+1}{2}, \forall p \).

Assumption 2 is merely a technical condition that must be satisfied for the identification strategy to be implemented. Otherwise, a single party commands the majority of the parliamentary seats regardless of the allocation of parliamentary seats under proportional rules.

**Proposition 2.** For any highest average method, the treatment assignment that indicates that a single party commands the majority of the parliamentary seats occurs through a known and deterministic decision rule: 
\( D = 1[X > 0] \).

**Proof:**

The proof is analogous to the pure proportional case except that the pivotal seat distribution is defined as 
\( (\frac{N+1}{2} - B_1, \frac{N+1}{2} - B + B_1; \alpha_1, \alpha_1|N, \hat{\Omega}, \gamma, B, B_1) \) instead of as the seat allocation 
\( (\frac{N+1}{2}, \frac{N+1}{2}; \alpha_1, \alpha_1|N, \hat{\Omega}, \gamma) \) as in the pure proportional case.

QED.

It can be concluded that a seat allocation under mixed proportional rules \( (w, N - w; \alpha_1, \alpha_1|N, \Omega, \gamma, B, B_1) \) is fully determined by the set of parameters \( (N, \Omega, \gamma, B, B_1) \). In this framework, pure proportional rules could then be viewed as a special case when \( B = 0 \) (also implying that \( B_1 = 0 \)).

### 2.4 Empirical Strategy and Data

#### 2.4.1 Empirical Strategy

The regression discontinuity design can be implemented by estimating the model

\[
Y_{it} = \beta_0 + \beta_1 D_{it} + k(X_{it}) + \varepsilon_{it},
\]

where \( Y_{it} \) is the dependent variable in municipality \( i \) in year \( t \), measuring either the percentage change over one fiscal year in total public expenditure per capita, or some of
its components. Alternatively, \( Y_{it} \) measures the annual percentage change in the share of a component of total public expenditure to total public expenditure. This specification has the advantage to measure the effect out of a fixed budget. \( D_{it} = D_{it}(X_{it}) = 1[X_{it} > 0] \) is a binary variable taking a value of 1 if the assignment variable \( X_{it} \) is non-positive and 0 otherwise. The coefficient \( \beta_1 \) measures the effect of switching from a single party government to a coalition government at the threshold \( \bar{X} = 0 \). To reduce a potential bias due to the choice of functional form, the model allows for a flexible fit of the data by the polynomial \( k(X_{it}) \). I use heteroskedastic robust standard errors \( \varepsilon_{it} \).

Estimating this model with RD design overcomes the following endogeneity issue. On the one hand, the two forms of governments, coalition as opposed to single party, can choose different levels of government expenditure or which items to spend more on. On the other hand, the spending decisions of an incumbent government could influence the likelihood of form of government in the following electoral cycle.

### 2.4.2 Data and Descriptive Statistics

Spain uses a proportional electoral system, in which each party runs a closed party list of candidates. As noted in Section 2, a close party list of candidates is predetermined by the respective political party and cannot be altered by the voters, who cast a ballot for this political party. Spain uses this electoral system at all levels of government: national, regional (autonomous communities), provincial and municipal. The number of candidates from each party list who are elected in the legislature is determined by the d'Hondt method, which has also been described in Section 2. In Spanish municipal elections, each party list must receive at least 3 % of the cast ballots in order to be eligible to receive seats in the municipal council, the legislative body at the municipal level. At the same time, it must be noted that a party list is not guaranteed to receive at least one seat if it receives a vote share above electoral threshold of 3 % required for representation. For small-sized municipal councils, the effective electoral threshold to obtain a seat may exceed its legal counterpart.³

Legislation passed at the national level determines the political framework of local government in two additional main respects: tenure in office and the size of municipal councils.

³The distinction between an effective and a legal electoral threshold are both methodologically and empirically addressed in Section 6.
Municipal council have a fixed term of four years in office that may not be legally terminated. In this respect, the municipal councils differ from the national and regional legislatures whose term may be terminated before the 4th year in office by a vote of non-confidence in the respective legislature. This institutional feature prevents the formation of endogenous electoral cycles at the municipal level. This is an important consideration as the ability to call early elections may generate differences in tenure between the two forms of government. In addition, coalition governments relying on the legislative support of more than one political party may in the alternative face a persistent and credible threat of a non-confidence vote and early elections. In addition, all municipal elections within a single autonomous community take place simultaneously, ruling out the possibility of different aggregate shocks affecting municipalities. In addition, upper level governments could not exploit differences in the timing of the elections to pander to different groups of municipalities with equalization transfers to municipalities or other policy tools at their disposal.

The municipal council is the legislative body in Spanish municipalities with population of at least 100 residents.\textsuperscript{4} The municipal council’s responsibilities include passing legislation, voting the budget as well as electing a municipal government including a mayor. Importantly, the constitutional jurisdiction of the municipal council to elect a mayor prevents the possibility of a divided government.

Municipal councils also differ in size based on nationally-established thresholds of population size, ranging from 5 councillor seats in municipalities with population between 100 and 200 residents to 57 councillor seats in Madrid, the largest city of Spain. In the autonomous community of the Basque Country, municipal councils range from 5 to 29 seats.

Municipal governments have a considerable degree of autonomy over fiscal matters. The present-day system of fiscal federalism is rooted in the provisions of the Spanish Constitution of 1978, which lays down two main principles - financial autonomy and financial self-sufficiency - of municipal jurisdictions. The principle of financial autonomy means that municipalities can make their own decisions on raising revenue and how to spend it. The principle of financial self-sufficiency is aimed at guaranteeing that all municipalities have the fiscal capacity to exercise their competencies.

The fiscal responsibilities of Spanish municipalities include: the construction and maintenance of roads, the water supply and the sewage systems, public lighting, cemeteries, waste collection, cleaning of public areas, access to urban area as well as food and drink

\textsuperscript{4}Municipalities with less than 100 residents directly elect a mayor and have no municipal council.
control. In addition, municipalities with larger population have jurisdiction over additional areas. The inclusion of jurisdiction over additional areas is based on a municipality meeting a population thresholds at 5,000, 20,000 and 50,000 residents. The inclusion of fiscal responsibilities progressively builds on the existing set of fiscal responsibilities as each population threshold is exceeded. Those municipalities with population larger than 5,000 residents have additional responsibilities over public parks, public libraries, market, and waste management. Similarly, those municipalities with population in excess of 20,000 residents have additional responsibilities over civil defense, social work, fire safety, and sports facilities for public use. Finally, the municipalities larger than 50,000 residents are also responsible for providing public transit and environmental protection.

To fulfill these fiscal responsibilities, municipalities rely on a range of revenue tools that include income from self-owned assets, local taxes, surcharges on taxes collected by autonomous communities and provinces, shares of tax revenue collected by the national government or those of the autonomous communities, subsidies (transfers) from upper-level governments, public fares, credit transactions, fines and revenue from other financial sanctions.

The dataset I use is compiled from three sources. I use electoral data for 4 municipal electoral cycles (1995, 1999, 2003, 2007) for 251 Spanish municipalities in the autonomous community of the Basque Country, obtained from the Department of Security of the Basque Country. In addition, I use public sector municipal data (1997 - 2010) in the autonomous community of the Basque country. These data include detailed information on revenue and spending and their components. The public sector data and the census data are publicly available from the website of the Statistics Institute of the Basque Country. In addition, in this data I have access to other economic variable such as municipal GDP and unemployment. The third source of data is census data also obtained from the Statistics Institute of the Basque Country, which includes a range of socioeconomic characteristics on population, ethnicity, and educational attainment. I use data collected from the censuses conducted in 1991, 1996, 2001, and 2006. The data in each census year is matched to the corresponding electoral cycles, with the census year preceding or concurrent with the first year of each electoral cycle that is indicated in Table C.6.

I restrict the empirical analysis to municipalities whose population lies between 100 and 5,000 residents. The lower bound is necessitated because municipal councils are elected...
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only in those municipalities with at least 100 residents.⁵ The upper bound is warranted on the grounds that the municipalities with fewer than 5,000 residents have identical fiscal responsibilities. This an important consideration because this paper argues that incumbent governments engage in manipulating the composition of spending due to the presence of fiscal rules and/or the limited fiscal autonomy of subnational governments. For this reason, it is recommended that each expenditure variable includes identical items across observations. This restriction has a relatively small effect on the sample size as the municipalities with population size ranging from 100 to 5,000 residents includes approximately 74% of all observations. The corresponding municipal council size to this subsample ranges from 5 to 13 seats, increasing in steps of 2 seats. All municipal councils in the Basque Country have an odd number of seats.

The municipal data from the Basque Country over the electoral cycles (1995 - 2011) reveals two desirable features for conducting RD design. These two features are the frequent occurrence of both coalition governments and single party governments and the presence of relatively fragmented legislatures. Together, these two features suggest that I could anticipate a significant number of the observations to lie on both sides of and in proximity to the threshold of the assignment variable \( X \) constructed in Section 3. This is an important consideration for satisfying the technical requirement of RD design for a positive density at the threshold. In my data, 71% of the observations have municipal councils, in which a single party commands the majority of seats in the legislature. The remaining 29% of the observations, no single party commands the majority of seats in the legislature. The selection of windows of varying size, expanded by 1% on each side of the assignment variable \( X \), also reveals that there is enough data on each side of the threshold with no detectable breaks in the density as shown in Table C.14.⁶

The size of municipal governments, measured by their spending, makes up 9.32% of GDP based on data from 1996, 2000, 2004, and 2008, the years for which municipal level GDP data is available.⁷ The three main components of municipal spending for municipalities with

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⁵The residents of municipalities with fewer than 100 residents directly elect a mayor. In the municipalities with more than 100 residents, residents elect a municipal council and, in turn, the municipal council elects a mayor.

⁶More refined expansions of the window also reveal no breaks in the density of the assignment variable.

⁷A commonly used variable to measure the change in the size of government expenditure is the growth of the ratio government expenditure (G) over GDP. In this paper, I am unable to use this ratio due to the availability of GDP in each municipality only for the years 1996, 2000, 2004, and 2008. Notably, these data points do not coincide with either the start year or end year of each electoral cycle. Due to this data limitation, I am restricted in the use of ratio of \( \triangle \frac{G}{GDP} \) on two grounds. First, if I am to use the same year
population of less than 5,000 residents are spending on the provision of goods and services (48 %), investment in capital outlays and tangible investment (34 %) and employment (10 %) based on data from 2000, 2004 and 2008 - the first full-year during each electoral cycle as vivid from Table C.6.

The descriptive statistics reveal that coalition governments and single party governments in the subset of closely contested elections with a ±2% from the threshold of the assignment variable exhibit statistically significant differences in spending patterns in pre-election years (1998, 2002, 2006, 2010), measured in the annual percentage changes from year 2 relative to year 3 of the electoral cycle. Statistical differences are being observed for per capita (total) expenditure and two of its components, capital outlays and tangible investment, which are reported in the first three rows of Table C.7. In addition, there are statistically significant differences in the annual percentage changes to the shares of capital outlays and tangible investment to total spending, reported in the last two rows of Table C.7.

The changes in the five reported variable in Table C.7 reveal the same qualitative pattern between the two forms of government. Relative to single party governments, coalition governments engage in smaller annual percentages increases in per capita expenditure, capital outlays and tangible investment as well as in the shares of capital outlays and tangible investment to total spending.

It is worth noting that the differences in these expenditure variables are observed in Year 3 instead of in Year 4. The first reason for this observations could do with the fact that elections are scheduled during the first half of the election year (usually in the month of May) and the Spanish fiscal year runs from January to December. Secondly, the items for which we observe differences are investment local public goods, whose completion is likely to require several months or longer for completion.

The municipalities of the Basque country are inhabited by two main ethnic groups, the Basques and the Spaniards who make up 41.5 % and 48.8 % of the population respectively

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\[ \Delta \frac{G}{GDP} = \frac{G_{t+1} - G_t}{G_{t+1}G_{t}} = \frac{G_{t+1} - G_t}{G_t} = \Delta G. \]  

(2.6)

Secondly, the use of GDP from different years is problematic because GDP is available in years halfway through the electoral cycle. This implies that the policies of two consecutive governments would be measured in the change in G/GDP, which is undesirable from a research standpoint as it would compromise the re-election incentives embedded in this variable.
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in the rural municipalities with less than 5,000 inhabitants. Taking into account that 9.2% consider themselves both Spaniard and Basque, the share of all other ethnic groups is negligibly small. These ethnic divisions are also mapped in the voting behaviour of the members of these two ethnic groups. These ethnic divisions are also to a large extent translated in the voting behaviour of the members of the two ethnic groups. The members of each ethnic group appear to vote for a separate set of political parties. Political representation along ethnic lines is evident from the correlation coefficients between the share of each ethnic group and the combined vote share of the two main national political parties - the centre-left Spanish Socialist Workers’ Party and the centre-right People’s Party - in a given municipality. Importantly, the correlation coefficients corresponding to each ethnic group are of the same magnitude but of the opposite sign for the two ethnic groups. The correlation coefficient between the share of the Spaniards (Basques) in each municipality and the combined vote share of the two main national parties is 0.47 (-0.48). The inclusion of smaller national political parties does not change the nature of this relationship. The ethnic Basque tend to vote for regional parties such as the Basque Nationalist Party and Hari Batistuna (and its successors), the political wing of the terrorist organization ETA.\(^8\)

It is an important feature of the data that ethnically mixed municipalities constitute a significant proportion of the closely contested elections as measured by the assignment variable. To draw causal inference exclusively from the subset of ethnically-mixed municipalities is in general challenging as I require that each ethnic group can feasibly be politically represented. To address this issue, I use the result from Proposition 5 stating that any political party is guaranteed council representation if it obtains a vote share at least as high as \(\frac{100}{N}\) regardless of the distribution of the vote shares \(\Omega\). Using this approach has the advantage of taking into account the institutional feature of pure proportional rules, where this threshold is a function of the council size \(N\). It must be noted that this institutional restriction imposed on the separating the sample relies on some behavioural assumptions. First, there are no systematic differences in the voter turnout across ethnic groups. Secondly, voters of each ethnic group realize the risks of splitting up the ethnic vote into multiple political parties. I find no direct evidence that the first assumption is being violated. At the same time, I acknowledge that the second assumption is more contentious and an ethnic group may fail to be represented if the votes of the members of an ethnic group split up among

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\(^8\)Hari Batistuna and its successors have been banned from participation in some elections, necessitating the registration of the political party under different banners throughout its history.
several political parties.

2.5 Results

2.5.1 Baseline Results

The first major finding is that form of government induces a budget electoral cycle in specific composition of spending, rather than in total expenditure. I report that the gap in the increases of the shares of capital outlays and tangible investment to the total municipal budget between the two forms of government in pre-election years are -14 % and -20 % respectively. These effects, which are measured at the threshold of the assignment variable, are reported in columns 4 and 5 of Table C.9 and also illustrated in Figure C.1 and Figure C.2 respectively. The estimated coefficients are negative in sign because they measure the effect of a coalition government, the treatment, relative to a single party government as specified in the baseline regression. The effects on the shares of capital outlays and tangible investment can be contributed to two forces observed at the threshold of the assignment variables: increasing shares for single party governments and corresponding decreasing shares for coalition governments.

An alternative specification of capital outlays and tangible investment, measured as the percentage increase of each component over one fiscal year, also reveals large magnitudes, although they may be driven in part by an effect on total expenditure. Higher increases are also observed for per capita government spending on visible to voter items that can be classified as local public goods - capital outlays (-58 %) and tangible investment (-87 %). The corresponding effect on total expenditure (-21 %) is also large but noisy under several specifications. These three findings are reported in the first three columns of Table C.9 and also illustrated in Figures C.5, C.6, and C.7.

In contrast, I find no detectable effect in government expenditure between single party governments and coalition governments over the entire electoral cycle for the subset of elections with close margin of exceeding a threshold. In addition, the estimated coefficient (-7 %), albeit noisy and unstable, would under most specifications measure that coalition governments spend less than single party governments. This effect is illustrated in Figure C.8. Notably, the measured magnitude of this effect is also considerably smaller than the corresponding effect measured over one fiscal year in pre-election years. However, it must be noted that the estimated effect is drawn only from two electoral cycles due to data
limitations.

The finding that form of government induces an effect in the shares of capital outlays and tangible investment but not in other components of government expenditure could be possibly explained by the inclusion of visible to the voters items that are classifiable as local public goods (e.g. the construction and maintenance of roads, the water supply and the sewage systems). The finding that components with such characteristics are being targeted by incumbent governments is consistent with existing evidence in the literature (Shi and Svensson, 2006; Drazen and Slava, 2005 and 2010). At the same time, finding an effect in the composition of government spending but not convincingly in total expenditure could be consistent with the presence of institutional constraints that may limit some municipalities’ ability to finance government spending by running large deficits. Such explanation is plausible due to the relatively limited fiscal autonomy of Spanish municipalities, at least when compared to national governments, and also due to the presence of fiscal rules imposed by the European Union that place a cap on deficit financing of government expenditure. As a result, some municipalities may resort to manipulating the electorate by targeting the composition of spending as a second-best strategy. This is a formal argument advanced by Drazen and Slava (2005, 2010), which they support with empirical evidence. The possible reasons incumbent governments would target capital outlays and tangible investment could be associated with the inclusion of visible to the voters items classifiable as local public goods (e.g. construction and maintenance of roads and of the sewage and water supply systems).

Why does form of government generate an electoral budget cycle? There are no theoretical models to the best of my knowledge, in which the legislative process is being modelled, that address this question. Persson and Tabellini (2000), however, predict a more pronounced electoral cycle in monetary policy, i.e. higher inflation, if an incumbent government has to pander to heterogeneous districts in order to be re-elected relative to having to pander to a homogeneous district. Their prediction, however, is to the contrary of my finding if one is to make the assumption that the political parties propping up a coalition government, relative to a single party government, are more likely to appeal to heterogeneous groups.

Empirical evidence is also scant (Geys, 2006) providing only non-causal evidence of the effect of fragmented legislatures encompassing both divided governments and single party vs. coalition governments on pre-election government policy. My paper could possibly shed

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9No electoral cycle is a possible equilibrium if an incumbent panders to a homogeneous constituency.
light on this issue by using the fact that RD design draws causal inference from elections with a small margin of exceeding a threshold, where the incentives to influence the electoral outcome associated with the form of government are likely the strongest \textit{ceteris paribus}. In a coalition government, unlike a single party government, the re-election concerns of the incumbent political parties may not be aligned. For instance, a junior coalition partner in a coalition government faces a potential trade-off of using government policy to influence the formation of a hung parliament\footnote{In a hung parliament, no single political party commands the majority of the parliamentary seats.} in the following electoral cycle at the expense of losing votes due to perceived incompetence of the incumbent political parties. There are at least two reasons that make such trade-off plausible in elections with a small margin of exceeding a threshold: first, the proximity of a senior partner’ electoral support to the threshold of the assignment variable; and secondly, the potential electoral support of a junior partner may dictate that a junior partner’s only route to power is through the formation of a hung parliament.

My finding that coalition governments do not increase the size of government more relative to single party governments poses a challenge to the predictions of PRT. This challenge is particularly strong for the subset of elections with small margins of exceeding a threshold, where RD design has a compelling internal validity. This result is even more startling if one notes that coalition governments represent a larger proportion of the electorate in the subset of elections with small margins of exceeding a threshold. In my sample, I find that a coalition government is likely to represented at least 9.3 \% more residents relative to a single government, a difference that is statistically significant. This result exploits the fact that in this sample the support of the largest political party shows no statistical differences for the two forms of governments. The 9.3 \% estimate is based on a junior coalition partners with the lowest vote share whose parliamentary (council) support will be sufficient to pass legislation and elect a municipal government. In reality, as I do not observe the actual coalition-government formation, this figure is likely an underestimate because a junior coalition partner with a larger vote share may end up propping up a coalition government.

2.5.2 Results from Ethnically-mixed Municipalities

I find a more pronounced effect to the baseline results on the shares of capital outlays and tangible investment in pre-election years if the sample is restricted to the ethnically-mixed municipalities. I report that the gap in the increases of the shares of capital outlays and
tangible investment to the total municipal budget between the two forms of government in pre-election years are -16% and -31% respectively. These effects, which are measured at the threshold of the assignment variable, are reported in columns 4 and 5 of Table C.10 and also illustrated in Figure C.3 and C.4. The restriction of the sample is based on the argument advanced in Section 4.2 that each ethnic group must be large enough in size so that it can feasibly be politically represented. In this context, form of government may have implications on the distribution of political power across ethnic groups. As already noted in Section 4.2, each ethnic group is represented by a separate set of political parties. This type of political representation necessarily implies that a single party government is propped up by the representative of a single ethnic group. In contrast, a coalition government might be propped up political parties that represent both ethnic groups.

Drawing causal inference from this restricted sample allow for a different interpretation of the baseline results. A junior coalition partner representing a different ethnic group than the senior coalition partner may have an extra incentive to prevent the use of government expenditure as a policy tool as it decreases the likelihood of potential power sharing across ethnic groups. This is an important consideration taking into account that ethnically-mixed municipalities in the Basque Country have historically been subject to repression of ethnic minorities during the Franco regime (1939 - 1975) and also among the hardest hit by ethnic violence (Gardeazabal, 2011). In a broader perspective, this result shows that form of government could serve as a formal power-sharing institution across ethnic groups that contributes to either the expansion or the reduction in the variation in local public good provision over the electoral cycle.

2.5.3 Robustness Checks

I perform a series of robustness checks to provide credibility to the results reported in Section 6. The first set of test include falsifications tests, in which a placebo threshold is chosen. These placebo thresholds are chosen at intervals of 0.5% from the true threshold of the assignment variable, i.e. ±0.5%, ±1%, ±1.5%, ±2%. In each of these instances, the baseline window is kept at ±2% from the placebo threshold of the assignment variable and none of the obtained estimates indicates statistical significance even at the 10% level of confidence. In addition, I check for manipulation effects by running the McCrary test based on McCrary (2008) for a window ±2% and ±5%. The estimated densities reported in Figure C.13 do not reveal a break at the threshold of the assignment variable and are
thus suggestive of the absence of precise manipulation of the assignment variable. This result is also consistent with the relatively even number of observations on either side of the assignment variable reported in Table C.14.

The set of tests includes expanding and narrowing the threshold around the window of the assignment variable. In addition, to the baseline results I use the following windows - ±1%, ±3%, ±4%, and ±5%. The reported results in Table C.11 remain qualitatively similar to the baseline results and in addition they become more precise with the inclusion of more data. I also use a number of polynomials (linear, quadratic, cubic), to which the results demonstrate robustness.

I also perform tests that check whether there is a particular electoral cycle or municipal council size that could be driving the results. Due to the limited number of observations in the data, I exclude observations from one electoral cycle or one municipal council size at a time. The results reported in Table C.12 and Table C.13 are not indicative that a particular electoral cycle or municipal council size is driving the results, although the estimates on capital outlays become (marginally) insignificant under some specifications. If a different window (±3%, ±4%, and ±5%) is used, the results are statistically significant. Unfortunately, I am unable to cluster the standard errors at the electoral cycle level as I have too few cycles for reliable estimates to be obtained (Angrist and Pischke, 2009). Precision, however, improves as I include my data and I obtain statistically significant results for each of the following windows ±3%, ±4%, and ±5%.

Next, I test for breaks in the densities of other variables, to which the effect could be attributed. A particular threat to the baseline results could lie in potential differences in the fiscal capacity or the generated revenue to finance government expenditure between the municipalities on each side of the threshold of the assignment variable. Larger fiscal capacity, measured by GDP per capita, makes it easier to additional raise revenue from the tax base. Kessler (2013) predicts that a larger legislative body is associated with a shift in the composition of the government budget away from pork towards relatively more public goods, a prediction she supports using data from US municipalities. A key difference between the institutional settings in US municipalities and in Spanish municipalities is the respective absence and presence of a strong party discipline. An additional concern is that upper level governments may pander to larger in population size municipalities - an effect that could be correlated with the municipal council size as they carry more votes but a public good benefits everyone in the community. Each of these possible effect is potentially concerning because
the size of municipal councils, which is determined based on population thresholds, appears strongly correlated with the form of government. The frequency of coalition governments gradually increases with municipal council size as reported in Table C.8, suggestive of a possible continuous effect at the threshold of my assignment variable. Importantly, the densities of GDP per capita and municipal council sizes illustrated in Figure C.12 do not reveal a discontinuity at the threshold of my assignment variable.

It is also possible that the increased expenditure could be a result of raised direct or indirect taxes - a scenario that would invalidate the argument that incumbent governments are manipulating the electorate with increased spending. Figures C.9 and C.10, illustrating the densities of direct taxes and indirect taxes respectively, do not provide support for such interpretation. Another possibility is that fiscal transfers from upper level governments (autonomous communities, national, the European Union) might be driving the result. Solle-Ole (2007) advances the argument that partisan alignments of the same governing political party at the municipal and upper-level governments results in larger fiscal transfers to municipalities. They provide empirical evidence from Spanish municipalities supporting their theoretical prediction.\footnote{Their dataset does not include municipalities from the autonomous community of the Basque Country.} The main threat to this model is that coalition governments are being propped up by two or more political parties, increasing the likelihood of partisan alignment. Grau, Sole-Olle and Navarro (2013) find causal evidence from Spanish municipalities that increased transfers from upper-level governments arising from partisan alignments reward incumbent political parties at municipal level with increased vote share and increased likelihood of re-election. Importantly, they measure a stronger effect in less competitive elections and in municipalities that experience a switch in the incumbent less frequently. Each of these two effects is suggestive that the transfers from upper level governments to municipalities are likely to be continuous at the threshold of my assignment variable, which is illustrated by the local linear regression fit in Figure C.11. Importantly, the inclusion of each of these five variables - GDP per capita, municipal council size, revenue from direct and indirect taxes as well as capital transfers - as covariates do not alter the baseline results as reported in Table C.15. The inclusion of sociodemographic covariates such as ethnicity and ethnic fractionalization (measured as the Herfindahl Index) does not appear to influence the baseline coefficients either.

The relatively more frequent prevalence of relatively right ideology on the size of government expenditure in the subset of coalition or single governments also has the potential
of contributing to the observed baseline results. I am unable to directly test whether this is the case because the parties propping up a coalition government are unknown to the researcher. However, I am able to test whether ideology on spending has an effect on the size of government expenditure in the subset of single party governments. With the use of a simple t test, I compare the average increase in government spending between centre-left governments and centre-rights governments in pre-election years and over the entire electoral cycle. The centre-left governments included in the sample are those of the Spanish Workers Socialist Party or the EA and the centre-right governments are those of the People’s Party or the Basque Nationalist Party. Over the 4-year electoral cycle, the observed difference in government spending between the two groups is 7.11% with a standard deviation of 12.27. In pre-election years, the corresponding difference is 4.51% with a standard deviation of 11.64. The noisiness of the observed differences does not provide support in favour of the argument that differences in ideology within single party arguments might be driving the size of government expenditure over the four-year electoral cycle or in pre-election years. Ultimately, these results could serve to mitigate the concern that the relative prevalence of ideology on spending, more as opposed to less, across the subsets of single party and coalition governments might potentially be driving the baseline results.

Last but not least, I check whether the observed differences in the expenditure variables were able to precisely manipulate the form of government in the following electoral cycles. An indirect test that could be indicative of such effect is if lagged by one electoral cycle relevant spending and revenue variables are not continuous at the threshold of the assignment variable. The results from Table C.16 do not demonstrate that any of the includes covariates measures a significant effect or that they alter the baseline coefficients. In addition, other electoral manipulation strategies such as party exits or party mergers do not appear to influence the baseline results.

2.6 Electoral Reform

2.6.1 Methodology

A main property of my identification strategy is that a seat allocation defined as follows $(w, N - w; \alpha_1, \alpha_{-1}|N, \Omega, \gamma, B, B_1)$ is fully characterized by the parameters list $(N, \Omega, \gamma, B, B_1)$. This implies that the seat allocation can be re-computed in response to a change in one of these parameters ceteris paribus. Furthermore, for the methodological reasons outlined in
Propositions 1 and 2 once the new seat distribution is known, the assignment variable $X$ corresponding to the new parameter value can be re-computed as well. A major implication of a change in the value of one of these five parameters is that an observation can experience a switch in the form of government from a coalition to a single party government or vice versa. In addition, it is empirically likely that those observations experiencing a switch are in the proximity to the threshold of the assignment variable, thus providing predictive power to the RDD estimates in computing the economic effect of the change in the value of one of these five parameters. The reason RD design is likely to have predictive power to estimate this effect is because any change in the parameters affects those scores at the margin of earning their respective political party a seat. From a policy perspective, this property of the identification strategy allows for estimating the economic effect of specific parameters of pure proportional systems such as the size of the legislature ($N$), the minimum legal threshold for representation ($v$) as well as a legally determined number of bonus seats awarded to the largest party ($B_1$).\footnote{If the largest in terms of vote share political party is being granted a bonus number of seats, these number of seats could be represented by the parameter $B_1$. Since no other political parties receives bonus seats, $B_1 = B$.} In addition, this property could be also used to estimate the economic effect of moving from a relatively more majoritarian to a relatively more proportional electoral system or vice versa by changing the values of the parameters $B$ and $B_1$. Importantly, this effect is estimated through form of government and capture the theoretical prediction of PRT that electoral rules affect government policy only through form of government.

Motivated by an electoral reform that would see the size of Spanish municipal councils slashed in 2015, I develop a formal argument of and provide estimates of the economic effect of reducing $N$. A similar argument, however, could be developed for any of the remaining parameters. First, let me develop some new notation to indicate the seat allocation before and after the reduction of the council size from $N$ to $N'$. This notation is consistent with the pure proportional rules used in Spanish municipalities, i.e. $B = 0$ and $B_1 = 0$. Consider an initial seat distribution $(w, N - w; \alpha_1, \alpha_1|N, \Omega, \chi)$ with a corresponding pivotal seat distribution $(\frac{N+1}{2}, \frac{N-1}{2}; \alpha_1, \alpha_1|N, \hat{\Omega}, \chi)$. If the size of the legislature changes, there is a new seat distribution $(w', N' - w'; \alpha_1, \alpha_1|N', \Omega, \chi)$ with a corresponding pivotal seat distribution $(\frac{N'+1}{2}, \frac{N'-1}{2}; \alpha_1, \alpha_1|N', \hat{\Omega}, \chi)$. The corresponding values of the assignment variable are denoted by $X$ for the initial seat distribution and by $X'$ for the new seat distribution.
**Proposition 3**  A change in the legislature size from $N$ to $N'$ could lead to a change in the form of government if $w \in \left\{ \frac{N'+1}{2} - N + N', \ldots, \frac{N'-1}{2} + N - N' \right\}$.

**Proof:**

Consider the following four cases:

Case 1: Suppose that $w \in \left\{ \frac{N'+1}{2} + N - N', \ldots, N \right\}$.

In case 1, there is a single party government for legislature size $N$. The reduction of seats $(N - N')$ implies that $(N - N')$ is the maximum number of scores that $\alpha_1$ could have a rank $N' < r \leq N$. Even if the $(N - N')$ number of scores have such rank, $w' \in \left\{ \frac{N'+1}{2}, \ldots, N' \right\}$, i.e. there is a single party government.

Case 2: $w \in \left\{ \frac{N'+1}{2} - N + N', \ldots, \frac{N'-1}{2} \right\}$.

In case 2, there is a coalition government for legislature size $N$. The reduction of seats implies that only the $N'$ highest scores grant a seat. This implies that no political gains seats in response to the reduction in the council size. As $\frac{N'-1}{2}$ is a seat allocation associated with a coalition government for $N'$, there is no change in the form of government.

Case 3: $w \in \left\{ \frac{N+1}{2}, \ldots, \frac{N'-1}{2} + N - N' \right\}$.

In case 3, suppose that $w \in \left\{ \frac{N+1}{2}, \ldots, \frac{N'-1}{2} + N - N' \right\}$, i.e. there is a single party government. If $\alpha_1$ possesses a sufficiently large number $w - \frac{N-1}{2}$ of scores with rank $N' < r \leq N$, $w' \geq \frac{N'-1}{2}$.

Case 4: $w \in \left\{ \frac{N'+1}{2} - N + N', \ldots, \frac{N-1}{2} \right\}$.

This case is analogous to Case 3.

QED.

Proposition 3 has an important implication on the predictive power of RD design in estimating the economic effect of an electoral reform through the form of government as they place both a lower bound and an upper bound on the initial number of parliamentary seats $w$ held by $\alpha_1$. Although corresponding bounds for $X$ can be computed for realized values of $N, \Omega, \underline{x}, B, \text{and} B_1$, they would not provide as sharp a prediction. However, due to the intimate relationship that exists between the minimum transfer of the popular vote, $X$, and the minimum transfer of parliamentary seats, $\frac{N+1}{2} - w$, as possible assignment variables, it is anticipated that only those observations that lie relatively close to the threshold of the assignment variable $X$ are likely to experience a switch in the form of government. It is, however, an empirical exercise to check whether any of these observations would fall within a specified window of $X$.

At the same time, Proposition 3 leaves as an empirical question whether a reduction in
the legislature size from \( N \) to \( N' \) would influence the more frequent formation of single party governments or coalition governments. This is an empirical question that will be addressed later in this section. To illustrate how a reduction in the council size from \( N \) to \( N' \) could lead to a switch in the form of government, I refer to example 1.

**Example 1 (revisited)** The following numerical example illustrates how a reduction in the size of the legislature from \( N = 5 \) to \( N' = 3 \) results in a switch in the form of government *ceteris paribus*. Table C.5 demonstrates that if the two scores ranked in \( N' < r \leq N \) belong to parties other than Party A, there is a switch from a coalition government to a single party government. Initially, Party A commands only 2 of the 5 seats in the legislature, leaving it short of a majority. However, after the reduction in the legislature size Party A commands 2 of the 3 seats, that is the majority of the parliamentary seats. If you recall, \( X = 0.75\% \).

After the size of the legislature is reduced,

\[
\frac{42 + X'}{2} = \frac{15 - X'}{1}
\]  

(2.7)

The solution to this equation yields \( X' = 4\% \).\(^{13}\)

To estimate the economic effect, I impose the following behavioural assumption on voters and political parties.

**Assumption 3.** The distribution of vote shares \( f(v_1, v_2, ..., v_P | \sum_p v_p = 100, 0 \leq v_p \leq 100) \) remains the same when the size of the legislature is reduced from \( N \) to \( N' \).

Assumption 3 indicates that neither voters change their voting behaviour, nor entires, mergers or exits of political parties occur.

The economic effect of the electoral reform measures the average change in the pre-electoral spending adjusted for the population size for the subset of municipalities that would be affected by the electoral reform. Formally,

\[
\text{Economic Effect}_{it} = \hat{\beta}_1 \sum_i \sum_{t} T_{it} \text{Population}_{it},
\]  

(2.8)

where \( \hat{\beta}_1 \) is the estimated causal effect obtained from the baseline regression equation.

---

\(^{13}\)If I follow Proposition 1, I would use \( r_1 = 2 \), which yields the score = 21, and \( r_{-1} = 2 \), which yields the score = 16. Using score = 16 would result in Party B gaining an extra seat at the expense of Party A. This, however, would represent an invalid counterfactual as it would not generate a coalition government but provide Party B with a majority government at the expense of Party A. For this reason, the next highest ranked score \( r_{-1} = 3 \) (score = 15) is being selected.
\( T_{it} \) is an indicator variable that indicates whether a municipality would experience a hypothetical switch in the form of government as a result of a change in the size of its municipal council *ceteris paribus*. A value of 1 would indicate a switch from a coalition to a single party government; -1 - a switch from a single party government to a coalition government; 0 - no switch in the form of government. Such hypothetical switch in the form of government would occur if there is a change in the sign of the assignment variable in response to a change in the size of the municipal council. \( X_{it} \) stands for the value of the assignment variable of municipality \( i \) in electoral cycle \( t \) before the change and \( X'_{it} \) after the change. Formally,

\[
T_{it} = \begin{cases} 
1 & \text{iff } X_{it} > 0 \text{ and } X'_{it} \leq 0 \\
0 & \text{iff } (X_{it} > 0 \text{ and } X'_{it} > 0) \text{ or } (X_{it} \leq 0 \text{ and } X'_{it} \leq 0) \\
-1 & \text{iff } X_{it} \leq 0 \text{ and } X'_{it} > 0 
\end{cases}
\]

### 2.6.2 Spanish Electoral Reform - Reducing Municipal Council Size for 2015 Elections

There is a particular interest in exploring the extent to which a reduction in the legislature size influences the more frequent formation of one form of government over another, in order to assess the economic effect of an electoral reform that would see municipal councils slashed to varying degrees across Spanish municipalities in 2015. As already noted, the d’Hondt method allows for the possibility of switches in either direction - from coalition governments to single party governments and vice versa. At the same time, the descriptive statistics reported in Table C.8 the municipalities in the Basque Country reveal that municipal council size is inversely associated with the frequency of coalition governments. It is worth noting that the Basque municipalities differ in both the distributions of the vote shares \( \Omega \) and the municipal council size \( N \), making it unclear which effect generates the association between municipal council size and the frequency of coalition governments observed in Table C.8. Importantly, the legislature size generates an effective electoral threshold, which could be significantly higher than its legal counterpart (3 %) for the small-sized municipal councils observed in the data. The value of a full seat provides the vote share that guarantees any political party municipal council representation for any distribution of the popular vote under the d’Hondt method. For instance, in Example 1 when \( N = 5 \), the effective electoral threshold is 15 %, i.e. full 12 % higher than the legal threshold required for representation,
while the value of a full seat is 20 %.\footnote{Based on the argument advanced in Proposition 5, a vote share at least as high as the value of a full seat guarantees political representation regardless of the distribution of the popular vote.} For the outlined reasons above, it remains an empirical question whether we could attribute these differences in the frequency of coalition government either to the purely mechanical effect induced by the d’Hondt method or to behavioural responses observed in the distributions of the vote shares $\Omega$. The proposed method in this section could help shed light on this issue by directly computing the purely mechanical effect induced by the d’Hondt method, which is of particular interest in assessing the economic effect of an electoral reform that would affect all Spanish municipalities.

The Spanish national government is to implement a major electoral reform for the 2015 municipal elections that would affect to varying degrees the 8,084 Spanish municipalities in all 17 autonomous communities. The electoral reform includes two main aspects: the incorporation of the very small municipalities below a population threshold into larger municipalities and the reduction of the size of municipal councils by varying degrees. The first aspect of the reform would affect 3,725 municipalities with population less than 500 residents that will cease to exist as separate entities and will be amalgamated into larger municipalities. The second aspect of this reform, which is of particular to interest to this paper, would see the size of municipal councils reduced by varying degrees. The reform would also see the proportional reduction of the size of municipal councils of all municipalities. The overall reduction of municipal councillors would total 21,338, approximately a third of the present number of municipal councillors, 68,578 (Government of Spain, 2013). Based on my estimates, 17,815 of the councillor seats that would be slashed would be attributed to the elimination of the municipal councils in the municipalities with less than 500 residents.\footnote{My estimates rely on the perfect enforcement of the proposed 500 residents threshold.} This still leaves 3,523 councillor seats that would be slashed in the remaining 4,359 municipalities with a population larger than 500 residents. This reduction would constitute on average a 7 % decrease from the current levels if the population of these municipalities is held fixed. This reduction is likely to be even larger if one takes into account that the population of the municipalities with more than 500 residents will on average increase due to the incorporation of those municipalities with fewer than 500 residents into larger municipalities.
2.6.3 Simulations: Economic Effect of Electoral Reform

I perform two sets of simulations in response to a reduction of the municipal council size. The first set of simulations involve computing the value of the assignment variable corresponding to a new council size for each observation. A particular strength of this set of simulations is the ability to observe whether an observation experiences a change in the form of government in response to a reduction in the municipal council size. Combined with the result of Proposition 3 that only those observations in proximity to the threshold of the assignment variable can experience a change in the form of government, I could credibly use the RD design estimates obtained in Section 5 to assess the economic effect of an electoral reform. A main drawback of these simulations is that observations could experience a switch from coalition governments to single party governments and vice versa, thus allowing for the possibility of an overall ambiguous effect.

The second set of simulations involve computing the change in the effective threshold in response to a reduction in the municipal council size. A key advantage of this set of simulations is that observations could only experience an increase in the effective electoral threshold. This property directly stems from the fact that the lowest ranked score in a legislature of size $N'$ is at least as large in magnitude than the lowest-ranked score in a legislature of size $N$ ceteris paribus. The main drawback of this set of simulations is that I cannot assess the economic effect through this channel with the proposed identification strategy. Nonetheless, the obtained results can shed light on the intensity of the behavioural responses of voters and political parties.

The two sets of simulations are conducted for a reduction of each municipal council size by two seats. The first rationale behind this choice is that all municipal councils in the Basque have an odd number of seats. For this institutional peculiarity to be preserved, municipal councils have to reduced by an even number of seats. Secondly, the average reduction in the municipal council size in Spanish municipalities is approximately 7 %. In contrast, in my sample made up of councils ranging from 5 to 13 seats, a two-seat reduction would translate into municipal council size reduction ranging from 15.4 % to 40 %. The reason for this dramatic difference is that not all municipalities would be affected by the

\footnote{Small-sized councils experience larger increases because the council size reductions occurs in steps of 2 seats. A step of 2 seats represents a large share to the total number of seats for small-sized councils.}
electoral reform scheduled for 2015.\footnote{I do not have access to the new population thresholds that would be used for the determination of the new size of municipal councils.}

The results from the first set of simulations reveal a small number of observations that experience a switch in the form of government - 22. Of these observations, 13 experience a switch from coalition to single party governments and 9 experience the reverse switch. Furthermore, there are more switchers from coalition to single party governments for the observations from the elections held in 1999, 2003, and 2007, but not for those elections held in 1995. The first major observation is that there is a small number of observations experiencing a switch in the form of government in response to a proportionally large decrease in the council size. Secondly, there is a relatively large number of observations that lie in the proximity to the threshold of the assignment variable - approximately 20% of the data lie within a margin of ±2%. Last but not least, the number of observations experiencing a switch in the form of government in either direction is qualitatively similar. These three observations lead to the conclusion that a reduction in the council size does not have a mechanical effect in the d’Hondt method sense on the form of government.

The results from the second set of simulations reveal a notably different picture, indicating both a sizable and statistically significant increase in the effective electoral threshold. These results reported in Table C.17 are indicative that on average municipal councils would on average experience 4.28% increase in the vote share that is necessary to gain a political party representation in the municipal councils. Taking into the already high effective electoral threshold relative to its legal counterpart, provides a strong indication that even medium-sized political parties might be at risk of not gaining representation in the small-sized municipal councils observed in the data. Due to the size of these magnitudes, it is possible that various forms of behavioural responses by voters and political parties could be in effect leading to the formation of less fragmented legislatures and in turn more frequently formed single party governments. Such responses, if they indeed arise, would be consistent with the observed variation in the frequencies of the forms of governments for different-sized legislatures reported in Table C.8 in Section 4.2.

These two sets of simulations provide an important lesson for electoral reform. Changing the size \textit{per se} is unlikely to result in dramatic changes to the frequencies of form of government. However, doing so for small-sized legislatures could induce a higher effective threshold for representation with potentially sizable effects on the form of government.
through behavioural effects.

2.7 Conclusion

This paper proposes an identification strategy that makes suitable the implementation of a sharp RD design to studying questions related to form of government for the entire range of pure and mixed proportional electoral systems under very general conditions. My method differs notably in two respects from what has already been achieved in the literature on electoral competition drawn from closely contested elections First, in my method I extend the idea of drawing causal inference from closely contested elections to settings with an arbitrary number of political parties that markedly differs from the two-party/two-candidate majoritarian electoral systems primarily applied to US elections (Albouy, 2008 and 2009, Lee, 2001 and 2008, Lee, Moretti and Butler, 2004, McCrary, 2008), presidential-type systems with a legally set threshold for a winner to be declared (Brollo and Troiano, 2012) and two groupings with opposite interests on a single-dimensional issue (Pettersson-Lidbom, 2008). In addition, my method could be applied to mixed electoral systems as opposed to pure electoral systems (e.g. pure majoritarian, pure presidential). The fact that my method is based on the proportional electoral rules translating vote shares into parliamentary seats helps overcome the limitations of observed in the data variables (e.g. share of the popular vote, share of seats), which fail to capture the institutional setup of proportional electoral systems or to satisfy the technical requirements of a RD design under general conditions. My method also has the merit of being widely applicable to the pure and mixed proportional electoral systems used in 82 countries at the national and/or the subnational level making up by far the largest subgroup of parliamentary democracies.

I also find conditions allowing for the proposed identification strategy to estimate the effect of an electoral rule on government policy through form of government. Those conditions indicate that only those observations in proximity to the threshold of my assignment variable can experience a switch in the form of government, allowing to exploit the predictive power of a RD design in estimating the effect of an electoral reform. From a policy perspective, this property of my identification strategy allows for estimating the economic effect of specific parameters of pure proportional systems such as the size of the legislature, the minimum legal threshold for representation as well as a legally determined number of bonus seats awarded to the largest party. In addition, this property of my method could be also used to estimate the economic effect of moving from a relatively more majoritarian to
a relatively more proportional electoral system or vice versa. Last but not least, the benefit of my approach relative to measuring the direct effect of an electoral rule, such as the legislature size, on government policy (Petterson-Lidbom, 2006) is that it links a change in the legislature size to the distribution of political power. This distinction is important because in parliamentary democracies, usually characterized by strong party discipline, legislature size could be argued to matter because of its effect on the (in)ability of a single political party to command the majority of the parliamentary seats.

On the empirical side, using the proposed methodology I present causal evidence strongly suggestive that form of government induces an electoral budget cycle in the composition of spending. My paper provides further evidence to recent studies that in the presence of institutional constraints (e.g. fiscal rules or limited fiscal autonomy of subnational governments), governments may resort to targeting composition of spending as a second-best strategy. Drawing causal evidence from closely contested elections, where the incentives to use government policy in influencing electoral outcomes are perhaps the strongest, could serve to fuel future research exploring the forces that generate such an outcome in pre-election years. At the same time, I find no evidence that form of government generates differences in the size of government, posing a challenge to the theoretical prediction of PRT.

My second empirical finding is that form of government could serve as an endogenous political institution associated with the presence (or absence) of power sharing across ethnic groups with potentially significant implications on government policy. To make this interpretation possible, I use an institutional constraint implied by the proposed methodology to include only observations in the sample such that each of the two main ethnic groups can feasibly be politically represented. In this respect, this paper is the first to the best of my knowledge to uncover how a formal political institution could influence the size of and the variation in public good provision in ethnically mixed communities.

Last but not least, I estimate the \textit{ex ante} economic effect of an electoral reform that would see the size of municipal councils reduced in 2015 but find no effect. Instead, I find that the reduction in council size increases the effective requirement for representation to levels substantially higher than the corresponding legal requirement. This effect could potentially lead to less fragmented legislatures and in turn greater frequency of single governments. Effect in this direction is plausible due to the possibility of strategic voting favouring larger parties, party mergers and exits as well as deterred party entries.
2.8 References


[38] Schneider, Christina, 2010. “Fighting with one hand tied behind the back: political budget cycles in the West German states”, Public Choice, 142: 125150.


Chapter 3

Social Coercion and Time Contributions

3.1 Introduction

Low-income neighbourhoods of large and medium-sized cities in the developing world, commonly referred to as ‘urban slums’, experience disproportionate underprovision of local public goods by the government (e.g. trash collection, sewerage and water supply) both in absolute terms and relative to the more affluent urban areas of the same cities (UNHSP, 2003). This is an issue of global concern because urban slums accommodated approximately 31% of the world’s urban population in 2001 (UNHSP, 2003). A potential solution that could considerably alleviate underprovision in these areas may lie in the ability of a grassroots community organization to effectively organize collective action among residents of the community. In this context, residents’ contributions could serve as an important source of informal ‘tax revenue’ that a community organization could then use for the provision of local public goods.

Understanding the specific logic of sustaining an informal taxation provision system in urban slums, many of which have historically been founded as either illegal settlements and/or have a significant fraction of untitled residents, is crucial for the design of effective public policies. Of particular concern is that titling policies might undermine the ability of grassroots community organizations in urban slums to sustain high contribution levels from their respective members that are essential for the provision of local public goods in these urban areas (Field, 2007). One possible explanation could be that the titling process abruptly
destroys the historical cohesion\(^1\) of a community, in part because community members no longer share the common goal of providing security against government eviction to the entire community. Historically, the existence of a credible eviction threat in a particularly hostile environment has served as an important motivating factor for squatters to derive high benefit from voluntarily contributing their time and money to an organization capable of providing protection to the community. In this context, one of the accidental by-products of an extended period of property insecurity has been the dual use of voluntary contributions for the provision of local public goods (e.g. protection) as well as for the accumulation of state capacity\(^2\) that the community organization used to coercively raise revenue from its members once the benefit from contributing to the organization had diminished.

Why do we observe community organizations only in some of the low-income neighbourhoods of Quito that are inhabited by informal residents today? The key to answering this question lies in the nature of the informal residents’ settlement into the community. Those squatters who were non-organized and settled in already established neighbourhoods had to fend for themselves against government eviction, in part, because only a fraction of the residents faced this threat. The resulting lack of unity among residents is suggested to have undermined the creation of cohesion to the extent that it formed in illegal settlements. As a result, the historical differences in squatters’ settlement, crudely distinguished as organized vs. non-organized, led to the formation of different institutions in otherwise similar neighbourhoods of the same city over time.

To study the suggested mechanism, I use cross-sectional household survey data collected by Lanjouw and Levy in 1998 in a stratified sample of low-income neighbourhoods of Quito, Ecuador that contains a rich set of household- and neighbourhood-level characteristics. The main advantage of this dataset is that formal institutions do not vary across neighbourhoods, thus providing excellent conditions for isolating the effect of informal institutions on public good outcomes. In these data, I am able to distinguish between an informal tax system and a voluntary contributions-based system by observing either the presence or the

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\(^1\)For the sake of clarity, historical cohesion here refers to the cohesion that existed in the early stages of neighbourhood formation and is associated with the common goals that were shared by the residents of the community.

\(^2\)Besley and Persson (2011) define the term state capacity as the necessary infrastructure, in terms of administration, monitoring and enforcement, to raise revenue from an organization’s constituents.
absence of a community organization registered as a housing cooperative\textsuperscript{3} in a given neighbourhood. For historical and legal reasons, I argue that the only plausible explanation for observing a housing cooperative years after the formation of the neighbourhood is a history of a former illegal settlement. In this context, the housing cooperative is argued to have played a dominant role in providing protection against government eviction of the entire settlement. To demonstrate the strong link that exists between a housing cooperative and a neighbourhood’s roots of an illegal settlement, I provide both anecdotal evidence drawn from the anthropological literature as well as direct empirical evidence based on geographical and historical data extracted from various maps and atlases.

I pursue an IV empirical strategy to estimate the causal effect of the presence of a community organization on household time contributions by exploiting exogenous variation in the neighbourhoods’ geographical endowments. OLS estimation is likely to lead to biased estimates for two reasons. First, the historical cohesion of the community, which is unobservable to the researcher, is likely to have been driving the relationship between household contributions and the process of accumulating state capacity in a community organization. Secondly, household contributions are likely to have a persistent effect and current contributions may correlate with contributions in the past that were used for the accumulation of state capacity.

The IV strategy, on the other hand, is based on the premise that the historical cohesion of the community does not drive the relationship between the presence of a community organization and household contributions through any other channel than the accumulated amount of state capacity exhibited by the housing cooperative. First, I argue that the historical cohesion of the community is correlated with the neighbourhood’s geographic characteristics as strategic considerations dominated in the selection process of a location suitable for an illegal settlement. Community organizations sought locations with geographic characteristics that: (i) would offer natural protection against eviction in a hostile towards land invasions environment; and (ii) would also qualify the organization to register as a housing cooperative, and thus provide the organization with a legal mandate to seek the global title over the invaded agricultural land. The intersection of these two geographic characteristics implies that illegal settlements would likely have formed on rugged terrain, relatively far away from the historical centre of Quito on the North-South axis of the city.

\textsuperscript{3}For the considerations of a community organization to register as a housing cooperative, please see Section 2.1.
In the early stages, a community organization would take advantage of the natural surroundings of the illegal settlement by summoning up a large number of squatters only at key locations in order to curb an eviction attempt. But in an environment of unresolved property rights disputes and a credible eviction threat over an extended period of time, the necessity to organize squatters into providing protection would also unintentionally result in the continuous process of state capacity accumulation. In later stages once a global title is attained, the housing cooperative would use the provisions in the Law and Regulation on Housing Cooperatives (LRHC) to control the process of distributing individual titles and, in combination with the accumulated state capacity, to prevent the collapse of residents’ contributions to the organization.\(^4\) In conclusion, the provisions of the LRHC and the natural protection provided by the geographic endowments of the community are argued to have played a crucial role in sustaining residents’ contributions when they would normally plummet, as some authors such as Field (2004) have suggested, after individual property security has been attained.

I find that the presence of a community organization predicts a 50% and 176% higher time contributions to trash collection in public areas and to community patrolling respectively. These results survive a variety of robustness checks, in particular the inclusion of control variables associated with alternative mechanisms that could potentially undermine the main results. These mechanisms include: (i) self-selection of households into neighbourhoods with different characteristics; (ii) informal history (was part of households residency on this property without formal recognition); (iii) institutionalized instead of destroyed social capital during the titling process; and (iv) demand for public goods (government provision of those public goods). In addition, I compare the estimates from the baseline 2SLS model to OLS and report the results from several IV post-estimation robustness tests.

This paper aims to contribute to the social capital literature (Alesina, Baqir and Easterly, 1999, Alesina, Baqir, and Hoxby, 2004, Easterly and Levine, 1997, Miguel and Gugerty, 2005, Khwaja, 2002, Baland and Platteau, 1998, and Dayton-Johnson, 2000) that studies the relationship between cohesion, generally defined, and the provision of public goods.\(^5\) A particular challenge in this literature is to establish the exogeneity of a heterogeneity measure. For instance, Alesina et al. (1999) try to address this issue by including fixed effects and all their controls, the effect of heterogeneity becomes insignificant or even positive.

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\(^4\)Section 2 contains a detailed institutional background on the LRHC.

\(^5\)For a comprehensive survey of the literature, see Banerjee, Iyer and Somanthan (2007).
In this paper, I establish a causal link between cohesion and household contributions by claiming that the titling process destroys the historical cohesion of the community and such cohesion could only be manifested through the accumulated state capacity by a community organization.

This paper also emphasizes the crucial importance of the process of accumulating state capacity. It argues that the end result of this process helped a community organization sustain an informal taxation system, which relates this paper to recent work (Besley and Persson, 2009 and 2010, Vanden Eynde, 2011, Olken and Singhal, 2011) on state capacity and informal taxation by highlighting the conditions required for inducing households to continue contributing to the organization. The idea that state capacity is accumulated over time is borrowed from Besley and Persson (2009, 2010) and extended to a grassroots organization. Consistent with the predictions of their theoretical model, I suggest that the presence of a common threat to all residents leads to accumulation of state capacity. Vanden Eynde (2011) describes a similar process for a rebel group whose ability to informally tax farmers depends on the size of its rebel force but the tax rate influences the occupational decision of an individual - whether to remain a farmer or to become a rebel. Finally, Olken and Singhal (2011) highlight the coordinating role of community leaders and public officials and the importance of social sanctions by other community members in sustaining an informal taxation system, while this paper suggests that the reliance on sanctions becomes rather centralized with the accumulation of state capacity.

Third, the findings of this paper also bring together recent work on land reform and/or titling policies and research on local governance (Field, 2004, Hammond, 2008). Hammond (2008) finds that property insecurity may emerge partly as customary institutions collapse in response to the implementation of a land reform that transforms communal with individual property rights. This is because formal institutions lack the capacity to interpret the customary tradition, one if present could have provided a legal basis for the resolution of property rights disputes. In this paper, I argue that a community organization could play an important role in areas where formal institutions are likely to fail. A particularly strong illustration of such role is the process of individual titling, which is frequently accompanied with a transition from community enforcement to state enforcement and may result in an institutional vacuum at least in the short-run.

Last but not least, I argue that the suggested mechanism of this paper is extendable to a larger set of settings than the institutional framework of this study may suggest. I use
anecdotal evidence from a historical account (Fraser, 1999) to argue that the formation of nation-wide organized labour in the 19th century Britain could, at least in part, be explained by the suggested mechanism in this paper.

This paper is organized as follows. First, I discuss the institutional background of neighbourhood organizations in Quito, Ecuador. Second, I describe the data used in this study. Third, I discuss the empirical strategy. Fourth, I discuss the main findings and present key robustness checks. In the final section, I offer concluding remarks.

3.2 Institutional Setting

3.2.1 Neighbourhood governance in Quito

The existing legislation in Ecuador does not allow for governance structures at the neighbourhood level that have the ability to impose binding decisions on the residents of the community. In general, officials are appointed by the municipal government. An exception to this framework is present in some of Quito’s neighbourhoods, in which non-government community organizations had legal grounds to be registered as housing cooperatives. According to the Law and Regulation on Housing Cooperatives (LRHC), a housing cooperative has a governance structure with elected officials that is able to impose binding decisions on its members, who for historical and legal reasons include all residents of the neighbourhood. The LRHC also specifies that the legal form of a housing cooperative could be adopted only in neighbourhoods formed as a result of subdividing agricultural land, where the assigned role to a housing cooperative is to purchase a piece of land on behalf of its members.

In a historical perspective, the legal form of a housing cooperative has turned out to be the most common for the incorporation of agricultural land into the urban area of Quito. (Burgwal, 1995) On the supply side, sellers preferred dealing with a single buyer, while on the demand side, for the members the formation of a (pre-)cooperative gave at least some sort of protection in their attempt to get a plot of their own (Burgwal, 1995). Secondly, for many low-income households, many of whom were migrants from other parts of Ecuador, subdivisions of agricultural land in the most peripheral zones of Quito were the only way of acquiring a house of their own without the requirement to pay up-front or to secure credit.7

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6 There is a legal distinction between a pre-cooperative and a cooperative in the LRHC with respect to the possession of a global title by the organization.

7 Burgwal (1995) and Dosh (2010) generalize that (invading) community organizations were well aware that in the hostile towards illegal settlements environment they faced it was a prerequisite to reach a settlement
The neighbourhoods, in which housing cooperatives are being observed, have commonly been founded as illegal settlements\(^8\). Due to the legal provisions in the LRHC, the presence of a housing cooperative in a neighbourhood long after its formation is likely a symptom of unresolved property rights. In particular, the LRHC dictates that the objectives of a housing cooperative are threefold and must be completed in the following sequential order: (i) to purchase land on behalf of its members by obtaining a global title to the property; (ii) to distribute individual titles to its members; and (iii) to be dissolved upon the distribution of all individual titles to members of the housing cooperative. When taking these threefold objectives into account, legitimate questions can be raised as to why a housing cooperative fails to complete the process of distributing all individual titles several years after a neighbourhood has been formed.

The answer to this question could possibly be traced to the incentives faced by the leadership of the housing cooperatives as well as the process of acquiring state capacity by the housing cooperatives in those neighbourhoods founded as illegal settlements. Organizations in Quito that have organized land invasions for the formation of illegal settlements have commonly used the legal mandate of a housing cooperative to prevent government eviction. Burgwal (1995) and Dosh (2010) who study illegal settlements in Quito, Ecuador provide anecdotal evidence that is strongly supportive of this claim. An organization’s incentives to register as a housing cooperative could be traced to the acquisition of legal grounds to seek the global title over the invaded land. Furthermore, the possession of a global title eliminates the threat of government eviction even if squatters lack individual titles. Once a housing cooperative acquires the global title and the threat of eviction is eliminated, the elected leadership of housing cooperatives also faces perverse incentives of delaying the distribution of at least some individual titles in order to extend the life of the housing cooperative. This is a tactic that Burgwal (1995), Dosh (2010) and Lanjouw and Levy (1998) report to have been commonly practiced in housing cooperatives in Quito. The extent to which housing cooperatives were successful in implementing such tactics depended on the accumulated

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\(^8\) In the Quito context, a settlement, formed as a result of the subdivision of agricultural land but has not received a license by the municipal government that acknowledges these subdivisions, is deemed illegal (United Nations, 2003).
The process of accumulation of state capacity was gradual and in general depended both on the duration of an eviction threat as well as the severity of such threat. This process of accumulating state capacity by housing cooperatives could be well illustrated by Dosh’s (2010) graphical representation of the lifecycle of an invading organization in either Peru or Ecuador. During the ‘eviction threat’ stage, squatters in illegal settlements are willing to voluntarily contribute their time and money to the invading organizations as all residents of the illegal settlements face a credible threat of government eviction. But a persistent threat of government eviction would also generate an organizational response to better use these contributions to provide protection. Keeping records of and organizing volunteer schedules, were among the common manifestations of state capacity (Burgwal, 1995).

The key threat to the informal public good provision system arises when property security for an illegal settlement is achieved, a stage referred to as the ‘security trap’ that usually coincides with the acquisition of a global title by the housing cooperative. During this stage, squatters lose the incentive to voluntarily contribute their time or money to the housing cooperative as they no longer need protection against government eviction. This usually leads to a significant drop in revenue to the invading organization of an illegal settlement. This loss in revenue ultimately results in the collapse of the public good provision system operated by the organization. The causal effect of titling policies on revenue collected by community organizations is empirically verified for Peruvian illegal settlements by Field (2004) and supported by anecdotal evidence by Burgwal (1995) and Dosh (2010) as a legitimate concern for illegal settlements in Peru and Ecuador. Illegal settlements in Ecuador fared better in withstanding the 'security trap', Dosh (2010) argues, because of the accumulated state capacity as well as the legal tools that the LRHC provided to the leadership of a housing cooperative. A set of provisions in the LRHC enable the housing cooperatives

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9 Dosh (2010) provides an example with the Pisuli Housing Cooperative, whose leader overtly refused to distribute individual titles to the members of the housing cooperative. Other housing cooperatives have relied on less overt tactics and have simply waited for the property to be paid in full before an individual title was to be granted. Taking into account that a significant fraction of housing cooperative members are low-income households, it is hardly surprising that some members had faced difficulty in fulfilling their financial obligations to the housing cooperative.

10 Lanjouw and Levy (1998), who conducted the survey I use in this paper, point out that the leaders of invading organizations in Quito and Guayaquil were among those who resisted land titling programs extended to all individuals the most.

11 An invading organization is a commonly used generic term in Peru and Ecuador for an organization that had founded an illegal settlement. Some invading organizations in Ecuador registered as housing cooperatives.
to impose binding decisions on their members and to also impose severe penalties for those who disobey the collective-decision-making. Some of the most extreme penalties, listed in Articles 20 and 21 of the LRHC, entitle the Executive Council and the General Membership to expel members of the housing cooperative from the organization and from the community if they are deemed disloyal to the organization (Burgwal, 1995). These provisions have provided a housing cooperative with tools to hold individual members, even title holders, accountable to the organization if they failed to fulfill the mandated contributions by the organization. What has historically curbed abusive behaviour from the leadership lies in another set of provisions stipulated in Articles 110, 205 and 206 of the LRHC (Burgwal, 1995). These articles prescribe that in the case of electoral or financial irregularities a housing cooperative can be placed under a direct state supervision. A direct state supervision would include the replacement of the elected leadership with an appointed by the municipal government official(s). In this case, the role of the appointed official would include the sale of all vacant lots, the distribution of individual titles and the dissolution of the housing cooperative.

3.2.2 Location of illegal settlements - strategic considerations or geographic constraints

The geographic characteristics of a candidate location for an illegal settlement played a critical role in the selection process by an invading organization. Settling on land that is categorized as agricultural offered a considerable advantage to an invading organization. It would qualify the invading organization to register as a housing cooperative and thus legally seek the global title over the invaded land. In addition, a location that offers natural protection could make it easier to thwart an eviction attempt. More rugged, i.e. less accessible, terrain would require an organization to defend only few key locations of the community. In turn, this would allow an invading organization to summon up a large number of community residents at few key locations, thereby increasing the political cost of eviction by raising the probability of casualties. Therefore, the locations with most desirable characteristics for the formation of an illegal settlement would be agricultural land within the city limits that is surrounded by rugged terrain.

The unique features of the Guyllabamba valley, in which the city of Quito is located, provided great opportunities for invading organizations to choose locations with those desirable characteristics. The Guyllabamba valley has a flat floor surrounded by steep mountain
slopes from all sides whose shape is elongated on its North-South axis. For historical reasons, agricultural land could be found on the the North and South ends of the Guayllabamba valley. Minchom (1994) advances the argument that Quito was built in 1534 on rugged terrain near the midpoint of the Guayllabamba valley (on its North-South axis) to provide protection and to also possibly preserve the flat lands of the valley to the North and to the South of the city for agricultural purposes. Later in the colonial period, haciendas were formed on diverse altitudes (2500 m - 3500 m. near the equator), away from the historical centre of Quito, to exploit the different ecological levels of the Guayllabamba valley suitable for growing complementary types of produce.\(^{12}\) Importantly, these two historical facts suggest that agricultural land was formed on both flat and rugged terrain.

An important question that emerges is whether invading organizations indeed had a reasonable choice in selecting a location to form illegal settlements with specific geographic characteristics from a range of options. An alternative explanation could be that invading organizations had limited choice because of limited availability of land. This argument is to a large extent fuelled by the shape of the Guayllabamba valley that restricts Quito’s expansion by and large to the area of the valley. In this sense, Quito’s expandable area could be viewed as a fixed geographic area implying that more recently-formed neighbourhoods were by default settled on ‘leftover’ locations in the valley. To answer this question, one can look at the geographical restrictions that the Guayllabamba valley imposes on the city expansion. The elongated North-South axis and the narrow East-West axis of the valley naturally impose a North-South expansion of Quito. But there is a second factor in play - the rapid population growth during the period since the 1950s,\(^ {13}\) - that may have imposed severe constraints on more recently formed neighbourhoods with respect to the availability of land with specific geographic characteristics. If such constraints were indeed present, they would likely have affected illegal settlements, most of which were formed since the 1970s.

To rule out the plausibility that invading organizations had limited choice in selecting locations with alternative geographic characteristics, I draw on anecdotal evidence describing the time path of illegal settlements development. The configuration of the Guayllabamba valley imposes a North-South development of the city but the majority of illegal settlements

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12 According to a colonial description by Juan and Alloa (1748) who visited Ecuador in the 1730s (reported by Minchom, 1994) there were several broad categories of produce distinguished by altitudinal level: ‘...at the higher altitudes, the "haciendas de Paramos" produced wheat, barley and potatoes; on the plains, maize production predominated; and at lower levels, sugar cane...’

13 During the period 1950-2001 Quito’s population grew from 200,000 to 1.4 million (UNHSP, 2003).
were formed on the very narrow East-West axis of the city, in this way spreading to the least accessible corners of the city, like hills and ravines before the North and South edges of the valley were fully urbanized (Burgwal, 1995).\footnote{The Guayllabamba valley is approximately 35 km long on its North-South axis but about 4 km on its East–West axis at its widest.} Such choice is not surprising from a historical perspective noting that Quito was founded by its Spanish conquerors in 1534 as a ‘natural fortress’ in a hostile Indian countryside (Minchom, 1994) providing illegal settlements with natural protection against government eviction and exploiting the presence of agricultural land at various altitudes of the valley.

\section*{3.3 Data}

This paper uses cross-sectional household-level data from Quito, Ecuador collected by Lanjouw and Levy in 1998. In this dataset, households are randomly sampled from each neighbourhood, while neighbourhoods have been stratified according to their geographical location and the average income in the community. As a result, the dataset contains low-income neighbourhoods but is representative with respect to their geographic location in Quito. The dataset contains rich information on time contributions to specific public goods (e.g. trash collection in public areas, community patrolling), property rights arrangements, labour income, and demographic information as well as some aggregated indicators for the community, including the age of the community and the presence of a housing cooperative in it. In addition, I rely on government census data for neighbourhood-level characteristics such as the fraction of uncollected trash from each neighbourhood.

I have also collected geographic and historical data from various maps and atlases for 332 Quito neighbourhoods, which constitute almost the entire population of Quito neighbourhoods. First, I have mapped the exact location and boundaries of each neighbourhood from Ediguis (1998), the year in which the Lanjouw and Levy dataset was compiled. This information was used to extract information from topographic maps about the lowest and the highest altitudes of each neighbourhood as well as the surface distance between the locations associated with the lowest and the highest altitude of the neighbourhood, necessary to calculate the slope of terrain for each neighbourhood. In addition, I have collected data describing the geographical latitude of each neighbourhood as well as that of the Quito’s
historical centre from http://itouchmap.com/latlong.html. These variables are used to construct the latitude distance from each neighbourhood to the Quito’s historical centre on its North-South axis. Finally, I have constructed variables indicating the legal status of each neighbourhood and the year in which they were founded from Carrion and Vasconnez (2003) and the 1992 and the 2002 editions of Instituto Geográfico Militar (1992, 2002) respectively.

Tables E.1 and E.2 provide summary statistics for some of the key variables. In particular, time contributions to trash collection in public areas and to community patrolling are substantially higher in those neighbourhoods where a housing cooperative is present.\textsuperscript{15} In addition, the neighbourhoods where a housing cooperative is present in my sample share similar geographic characteristics, rugged terrain and latitude distance from the historical centre of Quito, with the population of neighbourhoods in the city of Quito founded as illegal settlements.

### 3.4 Empirical Strategy

The baseline model is given by:

\[
y_{is} = \beta_0 + \beta_1 d_s + x_{is}' \delta + \varepsilon_{is},
\]

where \(y_{is}\) indicates either the time contributions to trash collection in public areas (roads, pathways, community gardens/parks and social halls) by household \(i\) in neighbourhood \(s\) or the time contributions to community patrolling of household \(i\) in neighbourhood \(s\).\textsuperscript{16,17} The endogenous regressor \(d_s\) is taking a value of 1 if the neighbourhood relies on the governance structure of a housing cooperative and 0, otherwise. \(x_{is}\) is a vector of household and neighbourhood-level controls variables. The error term must satisfy \(E[\varepsilon_{is}|d_s, x_{is}] = 0\) to

\textsuperscript{15}The reported descriptive statistics are based on all observations except outliers. Outliers are defined as all observations, for which the time contributions to trash collection in public areas/to community patrolling exceed 100 min.

\textsuperscript{16}Each dependent variable is constructed in two steps. First, I compute the total number of hours per month for trash collection (per year for community patrolling) for each household member aged 10 years or older. Then, I compute the average contributions per household member aged 10 years or older.

\textsuperscript{17}I measure the dependent variable in per household member contributions instead of in total household contributions for the following reason: the informal taxation system, according to Burgwal (1995), that a housing cooperative is likely to rely on contributions from each community member above a certain age. Penalties, including fines, are applied to non-contributing individuals rather than households. (Burgwal, 1995 and Dosh, 2010) In a historical context, a housing cooperative would rely on summoning up as many community members possible at key locations of the neighbourhood to curb an eviction attempt. (Burgwal, 1995 and Dosh, 2010)
yield unbiased estimates.

Estimating this model with OLS is likely to lead to biased estimates for two reasons. The error term is likely to include the unobservable to the researcher historical cohesion of the community based on the arguments laid off in section 2 of this paper. A plausible concern is that the historical cohesion of the community could be driving both the size of household contributions and the accumulated amount of state capacity exhibited by the community organization. In addition to this issue, household contributions may have a persistent effect and current contributions could correlate with unobservable to the researcher previous contributions that were used for the accumulation of state capacity.

To account for these two concerns, I adopt an IV empirical strategy for estimating the effect of a community organization on household contributions. This empirical strategy rests on the identifying assumption that the historical cohesion of the community influences household contributions only through the accumulated amount of state capacity. In this context, the proxy variable for state capacity is a binary variable indicating either the presence or the absence of a housing cooperative in a given neighbourhood.\(^{18}\) This assumption is based on an exclusion restriction that includes two instrumental variables: slope of terrain and the latitude distance from the historical centre of Quito. Each of these two geographic characteristics correlates with features that represent the strategic considerations of an (invading) community organization in selecting a location for an illegal settlement. These features, as argued in section 2, helped an organization withstand a series of eviction attempts as well as ‘the security trap’. The geographic characteristics are also assumed to be unlikely to have no direct effect on household contributions.

Formally, the exclusion restriction is given by:

\[
d_s = \gamma_0 + \gamma_1 z_{1s} + \gamma_2 z_{2s} + \mathbf{x}_{is} \delta + \upsilon_{is},
\]

where \(z_{1s}\) is the slope of terrain and \(z_{2s}\) the latitude distance of neighbourhood \(s\) from the historical centre (on Quito’s North - South axis). For the IV estimator to be consistent, the following conditions must hold: \(E[\upsilon_s | z_s] = 0\) \(E[\mathbf{z_s} \epsilon_{is} | d_s, \mathbf{x}_{is}] = 0\) and \(E[\mathbf{z_s} d_s | \mathbf{x}_{is}] \neq 0\).

Several comments are in order to establish the exogeneity of \(z_{1s}\) and \(z_{2s}\) by arguing that each of these instrumental variables is ‘plausibly random’. The decisions made during the

\(^{18}\)Based on the arguments advanced in section 2, a binary representation of state capacity is appropriate. Housing cooperatives that are observed in the dataset are strongly suggested to have the ability to induce households to make contributions subject to the electoral constraints stipulated in the LRHC.
colonial era (prior to 1830): (i) to form the historical centre of Quito close to the midpoint of the Guayllabamba valley; (ii) to preserve the land to the North and to the South of the historical centre of Quito primarily for agricultural use; (iii) to form haciendas on both flat and rugged terrain are unrelated to the process(es) that led to the formation of illegal settlements since the 1970s. Furthermore, it is assumed that land with diverse geographic characteristics were available that offered (invading) organizations a considerable amount of choice in selecting a suitable location for an illegal settlement. The high degree of diversity exhibited by each of these two geographic characteristics accompanied with the severely constrained potential expansion of Quito implies that illegal settlements on average exhibit considerably different characteristics from those of other (low-income) neighbourhoods of Quito.

3.5 Results and robustness checks

3.5.1 Baseline results

Table E.3 presents the baseline 2SLS results. In the first column I report the estimates corresponding to trash collection in public areas and in the second column - those corresponding to community patrolling. The first stage results indicate that neighbourhoods located on more rugged terrain and further away from the historical centre of Quito, measured on its North-South axis, are positively associated with neighbourhoods, in which a housing cooperative is present. This result can be interpreted in the following way: a location further away from the historical centre, which proxies for agricultural land, is strongly associated with the presence of a housing cooperative. Similarly, rugged terrain that offers natural protection is also associated with the presence of a housing cooperative. This relationship is based on the premise that the invading organizations that set up illegal settlements registered as housing cooperatives in order to be legally eligible to seek the global title over the invaded land.

In Table E.3, I also present the second-stage results describing the effect of a housing cooperative on household contributions. The presence of a community organization has a positive and sizable causal effect on household time contributions to trash collection. This effect implies 50% more time contributed (per household member) to trash collections in public areas and 176% respectively for community patrolling, suggested by the respective coefficients 5.36 and 7.11 of the endogenous regressor reported in Table E.4. These results
are particularly important because in both neighbourhood types a significant majority of residents possess an individual title, a factor that is being controlled for at the household level.

In a community of 3,000 residents, the implied differences in terms of aggregate contributions would be 16,080 hrs. committed to cleaning public areas a month. Similarly, the corresponding figure to community patrolling would be 2,430 hrs. In the context that on average about 12% of the trash in the community remains uncollected by the government the size of these contributions is likely to generate a considerable impact on alleviating underprovision of public services. This is not a strong claim for two reasons. First, time contributions, unlike monetary contributions, are difficult to put into alternative use. Secondly, the nature of the two public goods is also suggestive that trash collection and community patrolling are unlikely to directly depend on the level of existing infrastructure (e.g. road construction).

Finally, the first three columns of Table E.7 provide evidence that an increase in the average (per household member) contributions is associated with a considerable increase in the household who switch to using public areas for recreational purposes. For instance, the coefficient in column (4) indicates the following relationship: the second increment 5 hrs. after the initial 5 hrs. contributed to trash collection are associated with 19% more households using public areas for recreational purposes. A similar relationship is also observed in columns (4) - (6) from OLS, when the dependent variable is a continuous variable of the time spent in public areas. The results from Table E.7 indicate that households likely place value in the provided public good indicated by the greater usage of cleaner areas.

3.5.2 Alternative Mechanisms

Table 4 suggests that the baseline results are consistent with the anecdotal evidence presented in section 2. These results, however, rely on the premise that the historical cohesion at the time of settlement drives household contributions through no other channel than the accumulated state capacity by a community organization. This subsection addresses the extent to which several alternative mechanisms could explain the observed patterns. These include: (i) selection of households; (ii) history of formal property rights; titling and institutionalized social capital; and (iv) demand for public services. Each of these mechanisms will be discussed in turn.
CHAPTER 3. SOCIAL COERCION AND TIME CONTRIBUTIONS

Selection of Households

There could be underlying differences between the socioeconomic characteristics of residents living in neighbourhoods that differ with respect to the presence of a housing cooperative. These differences could be in part attributable to the selection process of settling into neighbourhoods with different characteristics. For instance, it is natural to hypothesize that squatters to this day are likely to constitute a larger fraction of the population in former illegal settlements than in other neighbourhoods. In part, relative to other residents of Quito squatters are more likely to be wealth-constrained and low-income, otherwise unable to own a home of their own. Consistent with the theoretical public economics literature (Bergstrom, Blume and Varian, 1986), these characteristics of squatters would imply that they are more likely to have a lower opportunity cost of time and are thus likely to contribute more of their time to community projects. Such interpretation receives, however, conflicting empirical support (Table E.4, columns (1) and (2)). While residents with higher labour income contribute less to trash collection in public areas, they allocate more of their time to community patrolling. It is possible that there is an offsetting effect that the relatively more affluent households are more likely to have more valuable assets on their property that they would like to protect. Although such interpretation is not entirely implausible, it must be noted that the majority of the surveyed households are likely to have below-median incomes based on the neighbourhood stratification in the Lanjouw-Levy dataset discussed in Section 3.

Secondly, there could be underlying differences in the political views of squatters over those of other residents that translate into different preferences over engagement in collective action. Some circumstantial evidence could be associated with the lack of respect for private property rights and the organized nature of squatting. But such association may be spurious as it is unclear whether this behaviour was not driven by two other factors: being wealth-constrained and having limited access to credit markets. Although the leaders of community organizations could often be claimed to be associated with labour unions and left-of-centre political parties, such link for the membership of the organization is difficult to establish (Burgwal, 1995 and Dosh, 2010). A key flaw in the argument of underlying differences with respect to collective action would be the emergence of the ‘security trap’ in organizations in former illegal settlements. Housing cooperatives would probably not have relied on coercive tools if a significant fraction of their members were still volunteering their time to the organization after attaining individual property security (Dosh, 2010).
In addition to these considerations, it is also possible that locations with different characteristics result in a self-selection of people with respect to other socio-economic characteristics, including family size or age. Some reasons could include that some neighbourhoods are more family-oriented or they tend to attract residents of specific age group. In support of these considerations, Ioannides and Zabel (2007) and Bhat and Guo (2006) provide empirical evidence that identifies and measures the impact of social context and neighbourhood amenities respectively on the decision of households, frequently with similar characteristics, to move into a particular community.

To address these concerns, I am able to directly control for household characteristics such as income, age or family size. The benefit of including these controls is that they serve a dual purpose in the absence of indicators that could measure households’ political preferences or voting behaviour. Based on empirical studies on economic voting, these socio-demographic characteristics are suggested to be strong predictors of voting behaviour on the right-left political spectrum. For instance, Brooks and Brady (1999) provide evidence from US presidential elections that lower-income households are more likely to cast a vote for a Democrat candidate (on the left of the US political spectrum).

Another possibility is that residents of different communities may have different inherent preferences over the degree to which private or public areas require maintenance. Although I am unable to directly test for this effect, I could indirectly trace whether residents living in neighbourhoods, in which a housing cooperative is present, spend more time collecting trash on their property. The results from such regression would be useful to draw a valid inference under the assumption that residents’ preferences over the degree to which private versus public areas require maintenance do not differ. The results in the third column of Table E.10 indicate that no statistically significant relationship exists when controls and fixed effects are included, thus providing no evidence of inherent differences in residents’ preferences. In the absence of both controls and fixed effects or controls (Table E.10, columns 1 and 2), it must be noted that residents of communities, in which a housing cooperative is present, spend considerably less time collecting trash on their own property and, in addition, this coefficient is statistically significant.
CHAPTER 3. SOCIAL COERCION AND TIME CONTRIBUTIONS

History of Formal Property Rights

It is also plausible that residents who lack formal title may demonstrate different behaviour with respect to contributing to local public goods in part because they may still face a credible eviction threat. For this reason, they may still derive a greater benefit from contributing to various forms of collective action (e.g. community patrolling) that could be associated with eviction prevention. At the same time, differences in residents’ history could also be associated with different contribution levels. In particular, residents who acquired their title after settling into the community may in many respects have more in common with unitled residents than those residents who had a title at the time of settlement. In addition, the different titling histories may be capturing a long-term effect associated with the revenue system that was in place in the early stages of the community. This argument is in part based on the findings of Banerjee et al. (2005) who study the long-term impact of being assigned a particular land revenue collection system by the British colonial rulers in India.

To account for all of these nuances of formal history, I include a continuous variable that indicates the time spent as an informal resident as a fraction of the total time resided in the community; to be referred to for short as history of title holder.\(^{19}\) The inclusion of history of title holder as a control in Table E.4, however, reveals a somewhat different story. Indeed, those households that have held a title for a longer span of their residency are the ones who are less likely to contribute to trash collection (Table E.4, column 1). At the same, there is no statistically significant association between history of title holder and contributions to community patrolling, although the fear of eviction argument would have suggested an even stronger effect (Table E.4, column 2). Importantly, the inclusion of history of title holder as a control does not affect the baseline results in Table E.4.\(^{21}\)

\(^{19}\)A value of “1” indicates that the household was legally residing on this property since their settlement; a value of “0” indicates that the household does not have a legal document that allows them to reside in the property at the time they were surveyed; any values between 0 and 1 indicate that a household that obtained a legal document that allows them to reside on the property at a point in time after they started living on this address.

\(^{20}\)Two alternative controls include two binary variable indicating whether the household (i) possesses a title at the time they were surveyed and also (ii) whether they possessed a title at the time of settlement.

\(^{21}\)To shed light on the effectiveness of the governance structure of a housing cooperative in sustaining informal taxation, I also check whether a housing cooperative has a better leverage in extracting higher contributions from non-titled residents as opposed to titled residents. A split of the sample into two groups based on the possession of a title reveals that a housing cooperative has a larger effect on trash collection in public areas but a smaller effect on community patrolling. When the dependent variable is time contributions to trash collection in public areas, the reported coefficients with standard errors in parentheses are 5.11 (1.50) for the subsample of title-holders and 18.83 (3.10) for the subsample of non-title-holders. When the dependent
Titling and Institutionalized Social Capital

Last but not least, there is a possibility of different degrees of heterogeneity across communities even if the average characteristics of a number of socio-economic factors are comparable. The social capital literature (Alesina, Baqir and Easterly, 1999, Alesina, Baqir, and Hoxby, 2004, Easterly and Levine, 1997) suggests that greater within-community heterogeneity, which proxies for lower levels of cohesion, negatively influences public good outcomes. Some forms of heterogeneity could, for instance, have been an accidental by-product of the selection process of household settling into neighbourhoods with different characteristics and reflected in indicators of income inequality, for instance.

The most significant threat to the identification assumption could, however, be that any titling process may have institutionalized outcomes associated with the historical cohesion, different from the accumulated state capacity by community organizations. Such concern is plausible because the distribution of individual plots in former illegal settlements took place during a period when the historical cohesion was likely the strongest. Burgwal (1995) and Dosh (2010) suggest that this cohesion was associated with a relatively egalitarian distribution of individual plots that had a lasting effect on the within-community land inequality.

A second concern is that (invading) organizations may have intentionally sought a relatively large number of squatters to join the community, on whose size at least in part depended the defense of the community against eviction attempts. At the same time, a larger population could be associated with potentially more free-riding and smaller per household member contributions on average. (Issac and Walker, 1988) The descriptive statistics in Table 1 also reveal that the current population is on average larger in the Quito neighbourhoods, where a housing cooperative is present.

I address each of these two issues with the inclusion of control variables in the baseline regressions (Table E.4). While a variable for the population size is readily available in the Lanjouw-Levy dataset, I construct an indicator for plot size inequality from the households included in the sample size. Taking into account that only 20 households were surveyed in each neighbourhoods, there is some concern that the constructed measure might be subject

variable is time contributions trash collection in public areas, the reported coefficients with standard errors in parentheses are 6.88 (1.32) for the subsample of title-holders and 4.62 (1.61) for the subsample of non-title-holders. The results from this test might be suggestive that the possession of a title might not be as effective in reducing time contributions to local public goods in the presence of state capacity by a housing cooperative.
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Demand for Public Services

It is also important to investigate the possibility that the baseline results in Table E.4 may be driven by inherent differences in the demand for public goods. One particular concern is that the government may provide less public services to poorer neighbourhoods. In support of this claim, UNHSP (2003) provides evidence that it is a general trend in the developing world less affluent neighbourhoods to receive less services from the government. In addition, it argues that there could be an additional bias towards illegal settlements, which may not be serviceable by the government due to the lack of legal recognition. A second concern relates to quantifying the public space in the community that needs to be cleaned.

There are several indicators at my disposal that allow me to argue that these demand factors are unlikely to undermine the baseline results in Table E.4. I proxy for the demand for trash collection in public areas by: (i) controlling for the fraction of uncollected trash by the municipal government at the neighbourhood level; and (ii) a binary variable indicating whether most of a household’s trash is collected by the municipal government. With respect to the second concern, I introduce fixed effects indicating whether residents have access to a community garden/park, a social hall, both of them or neither of them. The corresponding public space to the response neither of them includes roads and pathways. I acknowledge that one limitation of this control variable is that it crudely quantifies public space in part because the variable is binary in nature. Furthermore, its qualitative measurement does not well correspond to the continuous nature of the dependent variable.

There are two additional concerns - possible ‘scavenger behaviour’ and a direct effect of the neighbourhood geographic characteristics on household contributions - for which, unfortunately, I am unable to provide empirical evidence. To argue that these factors are unlikely to undermine the baseline results, I rely on the findings of other studies as well as the anecdotal evidence provided in section 2. A plausible explanation why residents might have an incentive to spend more time collecting trash could be found in the monetary value that could be extracted from recyclable materials. ‘Scavenger’ behaviour, where predominantly low-income households in developing countries spend a considerable amount of time collecting recyclable materials for a living, is commonly observed in developing countries. Hernández et al. (1999), who conduct a survey on voluntary recycling in low-income neighbourhoods

\[22\] I rely on government census data from 1995.
of Quito, find that most residents consider the only real ‘waste’ to be products that cannot generate value to the household. In this respect, it appears unlikely that garbage collection as stated in the Lanjouw Levy survey question would have been commonly associated with the collection of recyclable materials.\textsuperscript{23}

Last but not least, it is possible that a relatively more rugged terrain may require more time spent to collect a unit of trash \textit{ceteris paribus}. This implies that steeper terrain, which was the technology that was used to transform household contributions into protection, continues to have a similar effect on a different public good in the present. If this hypothesis can find some empirical support, it would invalidate the identifying assumption. Two main arguments from the institutional setting could be readily applied and counter-argue such claims. Rugged terrain is only associated with the boundaries of the settlements, which takes the form of steep hills or ravines. Furthermore, housing cooperatives have settled on agricultural land, which suggests that such land is arable. It appears physically implausible that land with an average slope of approximately 20 % could have been used to grow marketable crops. The likely shape of these farms or haciendas was the size of relatively small valleys located on mostly relatively flat terrain but surrounded by very steep terrain from several sides.

A major factor that could be creating a need for more community patrolling are crime-related issues. I rely on two crime measures, the murder rate per 1,000 residents and an indicator whether a household’s property was broken into. The inclusion of either of these variables in the baseline regression (Table E.4, second column) does not affect the main result results as the coefficient of either variable are insignificant. Regrettably, I cannot directly test for crime-preventative measures by the government but based on the remarkably similar rates of uncollected trash across the neighbourhoods that differ with respect to the presence of a housing cooperative, I could potentially extrapolate that such measures are also likely to be comparable across communities that differ with respect to the presence of a housing cooperative.

\textbf{3.5.3 Robustness Checks}

As a robustness check of the main specification, I investigate the sensitivity of the main results to the choice of the econometric model. Alongside the baseline 2SLS estimates, I

\textsuperscript{23}The exact wording of the question is: ‘In the last month, how much time did you spend gathering garbage in public areas? (Roads or pathways, parks, fields, community center or social hall)’
present OLS estimates. Their comparison reveals that the sign of the OLS estimates are consistent with those of all IV models estimates. The magnitudes of the OLS estimates are comparable to those of the IV models estimates, although they are somewhat lower for the regressions.

I can also investigate the validity of the suggested mechanism in this paper by using overidentification tests. According to the methodological arguments advanced in this paper, each of the two geographic characteristics was associated with different aspects of the strategic considerations of a community organization in the process of choosing a suitable location for the formation of an illegal settlement. In this context, an overidentification test based on the Sargan statistic could have the following interpretation under the null and the alternative hypothesis:

$$H_0 : \text{no strategic considerations dominate in selecting a location}$$ \hspace{1cm} (3.3)

$$H_A : \text{some strategic considerations dominate in selecting a location}$$ \hspace{1cm} (3.4)

The overidentifying restrictions implied by the approach in this paper is never rejected. The p-values of the Sargan test, and related results, are reported in Tables E.7 and E.8. for contributions to trash collection in public areas and to community patrolling respectively. These results together with the suggested interpretation of strategic considerations provide me with additional confidence that in this paper I estimate the effect of community organization’s state capacity on current household contributions (i.e., not capturing the effect of some other variable correlated with the neighbourhood’s geographic characteristics).

Other robustness tests include some first-stage results. I report the $R^2$ and the Partial $R^2$ whose values are reasonably high. I also report the first-stage F-test, whose values provide evidence that the bias of key coefficient is likely very small (less than 1%).

Finally, there is a concern that the standard errors of the key baseline regression might be inconsistently estimated for two reasons. First, there is an excess zero problem associated with the large number of households, 37 % (79 %) of the sample, not contributing to trash collection in public areas (community patrolling) observed in the data. To address this issue, I could use heteroskedastic robust standard errors. Secondly, the use of a different number of observations in the first and the second stage, according to Karaca-Mandic et al. (2003), could lead to an underestimation of the standard errors. This would require some
form of clustering of the standard errors. In the baseline results in Table E.4 as well as in Tables E.5 and E.6 I report the grouped at the neighbourhood level standard errors. These standard errors are obtained by estimating both the first and the second stage of the 2SLS at the neighbourhood level. The estimated grouped standard errors, according to Angrist and Pischke (2009), are consistent and have good finite sample properties even for a small number of clusters (neighbourhoods).\textsuperscript{24}

One indicator suggesting that such concern is unlikely unwarranted is the estimation of the baseline regression at the neighbourhood level in both the first and the second stages.

### 3.6 Neighbourhood location - strategic considerations or geographic constraints

An underlying part of the identification assumption in this paper is that the strategic considerations outlined in section 2 dominated over the choice of a location, on which an illegal settlement was formed. Although this assumption is not testable, I provide indirect empirical evidence in support of the strategic considerations hypothesis. For this purpose, I rule out several alternative explanations that are consistent with the observed differences in neighbourhood’s geographic characteristics.

#### 3.6.1 Did observed housing cooperative neighbourhoods form as illegal settlements?

In section 2, I argued that the only plausible explanation for observing housing cooperatives years after the formation of a neighbourhood must be a history of a (former) illegal settlement. Consistent with the strategic considerations hypothesis, this would imply that the neighbourhoods in the Lanjouw-Levy dataset, in which a housing cooperative is observed, must have qualitatively similar geographic characteristics, rugged terrain and latitude distance, to those of the neighbourhoods formed as illegal settlements. Such relationship between housing cooperatives and illegal settlements could indirectly be tested by replacing the dependent variable in the first stage regression, the binary indicator indicating the presence of a housing cooperative, with the legal status of a neighbourhood at the time of its formation. Two indicators that could provide empirical support for this relationship

\textsuperscript{24}Angrist and Pischke (2009) engage in a discussion why clustering for a small number of clusters results in inconsistently estimated standard errors.
include whether the sign of each first stage coefficient and its significance level is robust to the change in the dependent variable (presence of a housing cooperative vs. the legal status of the neighbourhood at the time of its formation). For this purpose, I use data from two samples: one for the 20 neighbourhoods in the main dataset that indicates whether a housing cooperative is present or not and another that includes virtually the entire population of Quito neighbourhoods.25

A comparison of the coefficients from the first column (dependent variable: housing cooperative) and the second column (dependent variable: neighbourhood’s legal status) of Table E.9 reveal identical in sign and very similar in magnitude statistically significant coefficients for each of the two regressors. These results are indicative that the geographic characteristics of the neighbourhoods, in which housing cooperatives are present, are representative for those of Quito’s illegal settlements. An important qualification, however, is in order: the illegal settlements that are likely to be recorded in the dataset are those that have been successful at withstanding at least an initial set of eviction attempts. This form of selection bias, however, provides an additional credence to the strategic considerations hypothesis, in which the choice of location ex post played an important role.

3.6.2 Gradual expansion on the North-South axis

One concern is that the location of illegal settlements further away from the historical centre of Quito (North-South axis) may simply coincide with the fact that these neighbourhoods also happen to be more recently formed. The nature of this concern is that the geographic characteristics of the Guayllabamba valley, which impose a gradual expansion on the North-South axis of the valley, may be driving this relationship. At the same time, Burgwal (1995) noted that Quito’s illegal settlements were formed on the least accessible areas on the narrow East-West axis but further away from the historical centre of Quito, possibly due to strategic considerations. To reconcile at least in part these two alternative explanations, I test for the gradual expansion hypothesis by tracing the relationship between the latitude distance from the historical centre of Quito (North - South axis) and the age of each neighbourhood.

25Neighbourhoods are considered to have formed as illegal settlements if they are classified as either ‘without approval’ or ‘in the process of approval’ in either 1992 or 2002. The long period of recognition of illegal settlements suggested by Burgwal (1995) and Dosh (2010) reduces the likelihood that the sample of legally formed neighbourhoods would be severely contaminated by undetected illegal settlements. It is, however, possible that there is a selection bias in the subsample of illegal settlements. The illegal settlements that are likely to be recorded in the data must have successfully curbed at least an initial set of eviction attempts.
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The first column of Table E.9 reveals that such empirical relationship between the latitude distance from the historical centre and the age of the community indeed exists. But breaking down the sample into legal and illegal neighbourhoods based on their status at the time they were formed, reveals surprisingly different trends. While the subsample of legal neighbourhoods reveals a strong relationship between the variables in question (Table E.10, second column), no clear pattern could be established for illegal settlements (Table E.10, third column). These results provide strong evidence that the illegal settlements, unlike legally formed neighbourhoods, did not follow an expansion that would be naturally imposed by the shape of the Guyllabamba valley. But a remaining question that remains is to what extent do these results provide support for Burgwal’s hypothesis. The shape of the Guyllabamba valley severely restricts the possible expansion of Quito and for this reason there are few (if any) plausible alternative explanations other than Burgwal’s that could be offered.26

An underlying reason for observing different patterns for the two types of neighbourhoods could be that the subsample of legal neighbourhoods traces a long-term relationship over a period of over 400 years, while that of illegal neighbourhoods a short-term relationship over a period of about 30 years.27,28 To provide comparable results, I only include in the sample only neighbourhoods formed since 1970. This restriction notably leaves the results unchanged (reported in columns 4, 5 and 6 of Table E.11).29

3.6.3 Availability of land with specific characteristics

The identifying assumption is also based on the premise that land of different characteristics was available and the decision to form illegal settlements on relatively rugged terrain was based on the strategic considerations outlined in section 2. One concern is that the flatter agricultural land may already have been settled earlier and illegal settlements were driven into relatively inaccessible locations surrounded by rugged terrain. This argument is fuelled by the attached interpretation to the expandable area of Quito as fixed due to the shape of

26The very narrow East-West axis of the Guyllabamba valley makes it difficult to use longitudinal data to trace expansion on the East-West axis. This is in part because the Guyllabamba valley expands in a slight northwestern or in a slight northeastern angle at various latitudes.

27As noted earlier, illegal settlements took place in the period since the 1970s.

28From a statistical standpoint, there is a possibility that the neighbourhoods formed before the XX century behave as influential outliers.

the Guyllabamba valley (for details, please see section 2.3). In addition, illegal settlements have been among the youngest neighbourhoods of Quito that have by default been forced to settle on ‘leftover locations’ in the valley. To test whether the declining non-settled land has driven illegal settlements into locations surrounded by rugged terrain, I look at the relationship between the slope of terrain and the age of the community.

Table 5 reveals that a statistically significant relationship can not be observed between the slope of terrain and the neighbourhood age either for the entire sample or for the sub-samples restricted to neighbourhood type (legal vs. illegal) or to a specific time period (1970 - 2002) or to both criteria. These results indicate that, despite the geographic restrictions of the Guyllabamba valley, there was no detectable pressure on either legal or illegal settlements to settle on a relatively flatter or more rugged terrain as greater area of the valley was being transformed into residential or business areas over time.

3.6.4 Revanchist motives of indigenous groups

I also assumed that community organizations formed illegal settlements on agricultural land in order to be legally qualified to seek the global title over the invaded land. This assumption requires that there was no process that could have driven both the sprawl of illegal settlements during the period since the 1970s and the formation of haciendas on the North and South edges of Guyllabamba valley during the colonial era. The formation of haciendas during the colonial era and the organized land invasions since the 1970s do bear resemblance with respect to the tactics of illegal dispossession. In addition, the reliance of tacit acceptance of the new status quo is common to both processes.\textsuperscript{30} To argue whether

\textsuperscript{30} The formation of haciendas in Quito during the colonial era, however, was associated with the illegal and violent dispossession of indigenous lands. Munchom (1994) describes the enforced contraction on Indian grazing rights by haciendas as a ‘brutal process’ that was ineffectively resisted by the Indian communities. He provides evidence that violent dispossession in the Guyllabamba Valley was also common and was tacitly assisted by the Spanish authorities. In addition, some major landowners acted without waiting for formal rights and counted on tacit acceptance of their illegal enclosures.

\textsuperscript{31} The hacienda system, according to Kay (1974), evolved out of two closely linked processes: enserfdom of the indigenous population and expropriation of their lands. For historical reasons, by the end of the seventeenth century, according to Kay (1974) landlords found it in their interest to settle modest tenants on their large estates. These tenants had to pay a few services when required and recognize the property rights over the estate of the landlord; they became attached to the land and increased its value as they were sold together with it. The main method of recruiting labour in the hacienda system became the expropriation of community peasant land. Kay (1974) reports a CIDA report, according to which ‘... a class of predial dependents was established under a variety of institutional forms. The essential condition for creating such a class was to deprive a whole sector of the rural population of access to the land and its resources...’; i.e. any viable alternative livelihood. Many of the peasants from these communities were hired as seasonal
whether revanchist motives are indeed present, I rely on anecdotal evidence about the ethnic composition of the squatters who joined illegal land invasions, the political affiliation of the leaders of (invading) organizations and the historical context since the independence of Ecuador from the Spanish Empire in reverse order.

First, it is difficult to defend why revanchist motives would surface so long after Ecuador had gained independence in 1830. The period since World War II is not associated with any regime change in Ecuador that could possibly provide a plausible link that the formation of illegal settlements has indeed been driven by historical revanchist motives of indigenous groups who would demand back the land expropriated from their ancestors during the colonial era.

Secondly, the anecdotal evidence provided by Burgwal (1995) and Dosh (2010) suggests that any political involvement of politicians in the formation of illegal settlements was likely to be associated with labour unions and/or left-of-centre political parties. The views of political organizations with such ideological affiliation are more likely to have redistributive motives per se than those of restoring property rights to an earlier state.32

Last but not least, according to the anecdotal evidence provided by Burgwal (1995) and Dosh (2010) squatters of indigenous descent were unlikely to be the dominant group in illegal settlements. Furthermore, a significant fraction of the squatters were migrants from other part of Ecuador, a fact that makes it difficult to establish a link that the squatters were demanding the land of their family ancestors. In the Lanjouw-Levy dataset, approximately 13% of the households responded that they lived at a different address 10 years earlier. Among those who lived at a different address 10 years earlier, 84% responded that their previous address was in a city or village other than Quito. Although this descriptive statistic is not necessarily representative of the entire sample, it is likely to capture the dynamics of more recently formed neighbourhoods, including former illegal settlements.

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32 For instance, the leader of the LDLP Housing Cooperative who initiated the land invasion of the Herrera hacienda was a union leader from the Ecuadorian Union Confederation of Class Organizations (CEDOC). The LDLP Housing Cooperative also received parliamentary support from the Popular Socialist Party in settling the dispute over the property rights of the Herrera hacienda. (Burgwal, 1995)
3.7 Concluding Remarks

Many economists and social scientists argue that community organizations play an important role in the delivery of local public goods especially where the role of the government is inadequate. This paper suggests that the historical cohesion of a community in terms of the common goals shared by its residents can play an important role in the formation of state capacity, through which the organization becomes capable of imposing binding decisions on its membership.

The argument of this paper rests on the following premises. First, the cohesion of a former illegal settlement affects household contributions only through the accumulated amount of state capacity by the community organization. I argued that this mechanism was rooted in the origins of a neighbourhood’s formation when all residents of an illegal settlement shared a common goal of voluntarily contributing their time and money to an organization capable of providing protection against government eviction of the entire community. But the dual use of these voluntary contributions for the provision of public goods and the accumulation of state capacity provided a community organization with tools to coercively raise revenue from the residents of the community.

Secondly, community organizations are observed only in some of the low-income neighbourhoods of Quito despite comparable rates of informal residents now due to the nature of squatting that took place in these communities. Those squatters who were non-organized and settled in already established neighbourhoods had to fend for themselves against government eviction, in part, because only a fraction of the residents faced this threat. The resulting lack of unity among residents of those communities was suggested to had not facilitated the creation of cohesion to the extent that it had formed in illegal settlements. As a result, the historical differences in the nature of squatters’ settlement, crudely distinguished as organized vs. non-organized, led over time to the formation of different institutions in otherwise similar neighbourhoods of the same city.

Third, strategic considerations dominated in the selection process of a location suitable for an illegal settlement. Community organizations sought locations with geographic characteristics that: (i) would offer natural protection against government eviction in a hostile towards land invasions environment; and (ii) would also qualify the organization to register as a housing cooperative, which would provide the organization with a legal mandate to seek the global title over the invaded agricultural land. The intersection of these two geographic characteristics implied that illegal settlements would likely be formed on rugged
terrain, relatively far away from the historical centre of Quito measured on the elongated North-South axis of the I-shaped Guayllabamba valley (due to the formation of haciendas on the North and South ends of the valley during the colonial period).

An integral part to the argument of this paper was that strategic considerations dominated in the choice of location for an illegal settlement, i.e. such choice was not driven by the geographical restrictions imposed by the shape of the Guayllabamba valley. In this paper, I provided empirical evidence indicating that (i) illegal settlements were not formed on rugged terrain because only land with such characteristics was available; and (ii) illegal settlements followed a different pattern of expansion than the one imposed by the shape of the Guayllabamba valley and followed by the rest of the Quito neighbourhoods. In addition, anecdotal evidence suggests that the sprawl of land invasions since the 1970s was not driven by revanchist motives by indigenous groups whose land had been frequently illegally enclosed during the colonial period for the establishment of haciendas.

The baseline results provide empirical support for the argument of this paper. The presence of a housing cooperative has a strong and statistically significant positive effect on time contributions of community residents to two local public goods: 50 % for trash collection in public areas and 176 % for community patrolling. An IV strategy suggests that the results are not driven by: (i) self-selection of households into neighbourhoods with different characteristics; (ii) informal history; (iii) institutionalized social capital during the titling process; (iv) demand for public goods. The baseline results survive a variety of robustness checks: (i) the inclusion of control variables associated with those alternative mechanisms; (ii) comparison of the baseline 2SLS results with OLS; and (iii) several post-estimation 2SLS results.

These findings could have important implications for community governance strategies and titling policies. A first set of policies could aim to introduce reforms that codify existing quasi-legal tools of grassroots organizations, in either illegal settlements or in settings where land is community-owned, through which they administer, monitor or enforce collective decisions. These policies, on the one hand, could also serve to remove the incentives of grassroots organizations that seek to maintain the status-quo of not well-defined individual property rights. On the other hand, consistent with the argument of this paper they would strengthen the institutions of grassroots organizations that are used to sustain an informal tax system. Such considerations in policy-making are particularly important because the areas that lack legal recognition or well-defined individual property rights are in general
among those that receive the least amount of public goods. (UNHSP, 2003)

The applicability of this mechanism is not limited only to residential areas with poorly-defined individual property rights. The bargaining power of labour unions, stemming from their ability to mobilize their membership, is also suggested to have historically followed the process outlined by this mechanism.\textsuperscript{33} The ability of labour unions to mobilize their members is in many respects remarkable, strength that can be used for achieving inarguably beneficial outcomes (e.g. insurance benefits by pooling risk across members) as well as inarguably detrimental outcomes (e.g. work stoppage that disrupts the production process). If one takes the view that detrimental effects are likely to dominate from a welfare standpoint, government policies that regulate labour markets could be argued to be welfare-enhancing. This is because better working conditions are more likely to destroy 'solidarity' among workers, that is a key ingredient for the formation of labour unions. Some examples of policies that could prevent the formation of labour unions (e.g. job security and pension plans) have received a considerable attention in recent decades. For instance, strengthening job security or the creation/expansion of defined-benefit pension plans, if they are perceived as sufficiently good working conditions by a large number of workers, are more likely to prevent the emergence of an environment that fosters the formation of labour unions.

3.8 References


\textsuperscript{33}For a description of the applicability of this mechanism to labour unions, see Appendix A.1.


Chapter 4

Endogenous Property Rights in a Democracy

4.1 Introduction

Strong property rights protection is argued in a large segment of the new institutional literature to be essential for economic activity and economic growth. The absence of strong property rights protection, as argued by Alston and Mueller (2008), is often associated with sub-optimal level of investment as well as misallocation of labour to non-productive activities such as guarding against stealing assets to name a few. Governments, if unable to protect the property rights of one group from being illegally seized by another, contribute to such misallocation of resources. A notable example of unlawful seizure of assets by one group of society from another are the so-called land invasions due to their common occurrence in the developing world in recent decades. Dosh (2010) reports that a number in the tens of millions are estimated to have participated in land invasions in Latin American countries alone. The land redistribution arising from land invasions is also documented to have often ended up legitimized by a country’s democratic institutions after the fact. Due to their organized characters and political legitimization after the fact, land invasions contribute to the formation of poor property rights protection in democracies.

The main objective of this paper is to develop a model describing the incentives that generate the stealing of assets (e.g. land) from one group to another as well as the legitimization of this process through democratic institutions after the fact. Such model would serve the purpose of demonstrating how democratic institutions may facilitate this type of
I develop an occupational choice model with open-rule legislative bargaining features. The occupational choice framework is based on Ghatak and Jiang (2002) with two types of agents, classified based on their endowments as poor and rich. In addition, there are three types of technologies: modern, subsistence and stealing. The modern technology requires an entrepreneur who invests capital and supervises a worker; the subsistence technology requires only the time endowment of a subsister; the stealing technology transforms the time allocated by a subsister to stealing into income generated from stolen endowments. In contrast with the other two technologies, the modern technology requires the indivisible amount of time of the entrepreneur and the worker. Due to the endowment differences, rich agents can self-select into one of three occupational groups: entrepreneurs, workers and subsisters, while poor agents can self-select into the latter two occupations. The entrepreneurs and the workers interact in a labour market, where the equilibrium wage is determined by the outside option of a worker. The outside option of a worker is the income earned by a subsister using the subsistence and/or the stealing technology. My model deviates from the Ghatak and Jiang (2002) framework in two respects: the use of a third technology, the stealing technology, and the divisible allocation of time by the subsisters.

To model the political incentives of legitimizing stealing through democratic institutions, I add open-rule legislative bargaining features to the model. It is assumed that all members of an occupational group are represented by a single political party. I impose parametric restrictions on the shares of the poor and the rich agents in the economy such that no political party would command the majority of the parliamentary seats in the legislature. This assumption is standard in the legislative bargaining literature used to rule out the trivial decision-making in the legislature. A political party is chosen at random as the agenda-setter, providing it with the ability to make a policy proposal on the theft rate, the fraction of the rich agents’ endowment stolen by the subsisters. If the policy proposal acquires majority support, it passes and is implemented; otherwise, the status quo theft rate remains in place. To prevent the agenda-setter from rationally proposing a policy that leads to enacting the status-quo policy, I introduce open-rule as opposed to closed-rule legislative bargaining. This feature introduces an amendment stage, where another political party is chosen at random as the agenda-setter.

In this model, I assume that stealing is costly as subsisters’ opportunity cost is positive by allocating their time endowment from subsisting to stealing. In addition, the restoration of
property rights to the original owners is assumed costless. However, due to the timing a rich agent forgoes the option to have invested the stolen endowment in the modern technology.

The model proceeds into two periods. The first period proceeds into three stages: occupational choice, investment and time allocation decisions, legislative bargaining stage with the initial proposal and the amendment sub-stages, while the second occupational choice and allocation of time.

What is the main trade-off? The political party of the entrepreneurs prefers a lower theft rate to a higher one, while for the political party of the subsisters it is the reverse. The preferences of the workers and their political representatives are key to determining the equilibrium theft rate. On the one hand, the party representing the workers prefers a higher theft rate because stealing increases the outside option of the workers. However, there is a threshold theft rate past which there would be no rich agents willing to become entrepreneurs.

The main result of this paper is a positive equilibrium theft rate that is not subject to restoration in the legislature. This positive theft rate arises due to the subsisters allocating a positive amount of their time to stealing. They rationally anticipate that in the political stage would be not be subject to restoration. Due to the costly nature of stealing, subsisters allocate their time endowment such that the emerging theft rate in equilibrium maximizes their utility. This outcome, associated with poor property rights protection, results in an inefficient outcome. The reason this outcome is inefficient because the endowment is not used to its most productive use in the modern technology.

The second main result demonstrates an important distributional dynamic: the poor agents who are ex-ante identical in terms of their endowment holdings also end up ex-post identical in terms of income. The poor agents, however, are worse off relative to a possible labour market outcome, in which all agents in the economy had chosen to be subsisters.

This paper aims to contribute to the literature on property rights protection by stressing the incentives that give rise to the unlawful seizure of assets from one group to another and the legitimization of such actions by a country’s democratic institutions. (Acemoglu, 2003, Sonin, 2003, Fergusson, 2011, Bedasso, 2012, Diermeier et al., 2013). As much of this literature has thus far focused its attention on autocracies and democratic institutions captured by powerful elites (Sonin, 2003, Fergusson, 2011, Bedasso, 2012), my model provides an insight how democratic institutions could be used to promote poor property rights protection. The suggested channel in my paper relates to Acemoglu (2003), who recognizes
redistributive taxation as a source of poor property rights protection, but differs in terms of the costly nature of seizing the asset. This paper also remotely relates to the idea of Diermeier et al., (2013) that introducing democratic checks and balances such as additional veto players in a legislative bargaining context may not necessarily lead to stronger property rights protection if the players’ incentives are not properly addressed.

This paper also relates to the literature on the importance of inequality in influencing the strength of property rights protection. My model relates to that of Gradstein (2007) and the empirical findings of Keefer and Knack (2002) that wealth inequality adversely affects the quality of property rights institutions. My model, however, emphasizes that if the ex-ante identical poor agents are politically represented by different political parties due to their occupational choice, the theft rate is lower than if represented by a single political party.

In section 2, I describe the institutional setting surrounding organized land invasions. In section 3, I introduce the occupational choice model. In section 4, I augment the model with open-rule legislative bargaining features. In section 5 and 6, I solve for the efficient allocations and the equilibrium respectively. In section 7, I conclude with a brief discussion of the main results.

4.2 Institutional Setting

Land invasions are a widespread phenomenon in the developing world, including Latin America. Dosh (2010) reports that, throughout the second half of the twentieth century, it is estimated that a number of squatters measured in the tens of millions have participated in illegal land invasions that target both public and private land.

Land invasions are generally organized in nature involving the simultaneous seizure of land by a group of squatters. The organized nature of these land invasions makes it politically costly for law enforcement agencies to enforce the law by evicting the squatters. This is because the risk of casualties is likely to increase with the presence of large number of organized squatters as they may clash with police forces during eviction attempts. Empirical studies by Field (2007) and Lanjouw and Levy (2002), which use data from squatter settlements in Peru and Ecuador respectively, report on the high incidence of organized nature of forming those squatter settlements. In addition, Dosh (2010) provides anecdotal evidence suggestive of the prevalence of the organized nature of land invasions. Both Dosh (2010) and Burgwal (1995) document that squatting is costly as it requires the allocation of
time for both seizing land and protecting it against potential eviction attempts. In support of this argument, Field (2007) provides evidence from Peruvian squatter settlements that providing squatters with a title has led to an increase in labour supply possibly due to the decreased time spent guarding one’s property.

What are the political incentives behind legitimizing the seizure of assets from land invasions and why don’t land invasions occur on an even larger scale? In parliamentary democracies, redistributive policies pursued on a large scale would require sufficiently broad support in order to pass in the legislature. As land invasions may adversely affect the labour working in large farms, acquiring broad-enough support for their legitimization may indeed prove difficult to find. Anecdotal evidence by Burgwal (1995), who documents the formation of a squatter settlement ‘The Struggle of the Poor’ on the outskirts of Quito, Ecuador, indicates that broad enough political support were anticipated prior to the invasion so long as only part of the targeted hacienda was transformed into a squatter settlement. The threat of having workers in the hacienda lose their jobs was key for squatting only on a portion of the hacienda, which was later legitimized by the Ecuadorian parliament for a price suggested to be well below its market value.

4.3 Model

4.3.1 Timing of game

Period 1

Stage 1

At the beginning of this stage, each agent receives an endowment of 1 unit or 0 units. Each agent self-selects into one of three occupations - a subsister, worker or an entrepreneur.

Stage 2

Agents make two simultaneous economic decisions based on their occupational choice: investing their endowment and allocating their time endowment.

Stage 3

Each occupation is represented by a political party. The political stage proceeds in two sub-stages. In the initial sub-stage, a political party chosen at random as the agenda setter makes a proposal to revise the theft rate. If the proposed policy gains support in the Legislature, the game ends and outcomes are realized; otherwise, the game moves to the amendment stage, where one of the remaining two parties is chosen at random as the
agenda setter. If the proposed policy gains support in the Legislature, it is implemented; otherwise, the status quo policy is implemented. In both instances, the game ends and the outcomes are realized. The equilibrium theft rate determined in the political stage in period 1 is enforced in both periods 1 and 2.

**Period 2**

**Stage 1**

At the beginning of this stage, each agent receives an endowment of 1 unit or 0 units. Each agent self-selects into one of three occupations - a subsister, worker or an entrepreneur.

**Stage 2**

Agents make two simultaneous economic decisions based on their occupational choice: investing their endowment and allocating their time endowment.

Decisions within each stage are simultaneous and decisions across stages are sequential. The presence of a second period is necessary to prevent a political equilibrium with excessive stealing due to the sequential structure of the decision making. That is, political decisions are made in the last stage of the first period and take the occupational choice decisions of the rich and poor agents as given.

**4.3.2 Economic environment**

**Demographics and preferences**

Consider a two-period economy inhabited by agents whose population in each period is large and its size is normalized to 1. There are two goods in the economy, labour, and some final output which can serve as a consumption good. Each agent lives for one period and is endowed with 1 unit of labor. A fraction of agents \( \alpha \in (\frac{1}{4}, \frac{1}{2}) \) in each period receive an initial endowment \( e_t = 1 \) and the remaining individuals of size \( (1 - \alpha) \) receive no initial endowment, i.e. \( e_t = 0 \), where the subscript \( t \) denotes the time period in which the endowment is received. Individuals with \( e_t = 1 \), I will refer to as rich agents and those with \( e_t = 0 \) as poor agents. Each agent earns income by supplying labour and capital from their endowment and the resulting income \( y_t \) is consumed by the agent. Each agent \( i \) in period \( t \) is assumed to be risk-neutral and has a linear utility function:

\[ 1 \]

\[ \text{The concept of period is introduced for notational convenience. Stage 1 of period 1 and stage 1 of period 2 involve identical decision-making. This is also the case for stage 2 of period 1 and stage 2 of period 2. The decision-making corresponding to these two stages of period 1 and 2 can be distinguished by the subscript } t = \{1, 2\}. \]
Production technologies and occupations

There are three production technologies - entrepreneurial, subsistence and stealing, all of which are deterministic. One technology, described as the entrepreneurial technology, uses divisible units of capital $z_t$ and two indivisible units of labor (one unit of supervisory labour and one unit of ordinary labour) to produce:

$$q(z_t) = dz_t$$  \hspace{1cm} (4.2)

units of output, where $d > 1$ is an efficiency parameter of the entrepreneurial technology. One supervisor (or entrepreneur) can perfectly monitor one worker spending her entire labour endowment.

**Assumption 1.** I assume, as in Ghatak and Jiang (2002), that the entrepreneurial technology is superior in the sense that the net output of using this technology is greater than were two units of labor using the subsistence technology if the entire endowment of a rich individual is being invested. That is,

$$q(e_t = 1) > 2w + 1$$  \hspace{1cm} (4.3)

The second technology uses no capital and divisible units of labour supplied by a subsister to produce divisible units of output $w > 0$. This will be described as a subsistence (or an agricultural) technology, where the output $w$ will be referred to as the subsistence wage.

The third technology coverts the fraction of time $\tau_t$ allocated by a subsister to stealing the endowment of rich agents into output described as stolen endowments $\tau_t \alpha^S$, where $\alpha^S$ is the size of subsisters in the economy.

The three occupations of this economy are subsisters, workers and entrepreneurs, denoted by $\alpha_S$, $\alpha_W$, and $\alpha_E$, whose total size sums up to the population of economy, i.e. $\alpha_S + \alpha_W + \alpha_E = 1$. An occupation choice distribution is denoted by $\Gamma(\alpha_S, \alpha_W, \alpha_E)$.

The income profile of each occupation group is given as follows:

1. Subsister - earns income from stolen assets as well as labour income from the subsistence sector:
where $\tau$ for now is taken as an exogenous parameter. The indicator function term $1_{e_{t}=1}((1-\tau_{t}))$ denotes the case when a rich individual self-selects herself as a subsister.\footnote{In that case, a fraction $\tau_{t}$ the endowment of all rich agents including one’s own is stolen.}

2. Worker - earns labour income from the entrepreneurial technology, where the wage in the entrepreneurial sector $w_{t}$ is determined in a perfectly competitive labour market. She allocates her entire time endowment to supplying labour units in the entrepreneurial sector.

$$y^{W}_{t}(\tau) = w_{t} + 1_{e_{t}=1}(1-\tau_{t})$$

3. Entrepreneur - earns capital income from the entrepreneurial technology net of wage costs paid out to a worker and incurred losses from stolen non-invested assets $(1-z)$ at the rate $\tau$. She invests an amount $z$ of her wealth and allocates her entire time endowment to supplying labour units in the entrepreneurial sector, where she supervises one worker. She receives income from the entrepreneurial sector,

$$y^{E}_{t}(\tau) = q((1-\tau_{t})z_{t}) + (1-\tau_{t})(1-z_{t}) - w_{t}$$

The distinction between invested and non-invested capital is important. At the time when investment decisions made, property rights are fully protected. However, during the production process a fraction $\tau_{t}$ of both the invested and the non-invested capital is subject to theft.

Substituting for the entrepreneurial production function yields:

$$y^{E}_{t}(\tau) = d(1-\tau_{t})z_{t} + (1-\tau_{t})(1-z_{t}) - w_{t}$$

I assume $(1-2\alpha)\frac{z_{t}}{1-2\alpha} > w$. The condition $\frac{z_{t}}{1-2\alpha} > w$ guarantees each subsister strictly prefers stealing to working in the subsistence sector for any $\tau_{t}$. The extra requirement of $(1-2\alpha)\frac{z_{t}}{1-2\alpha}$ on the left-hand side is necessary to guarantee an alignment of the interests of each subsister to those of their representatives in the political stage.
Each entrepreneur invests an amount $z$ to maximize her income:

$$\max_{z_t \in [0,1]} y^E_t(z_t) = d(1 - \tau_t)z_t + (1 - \tau_t)(1 - z_t) - w_t,$$  \hspace{1cm} (4.7)

The first-order condition yields:

$$\frac{dy^E_t(z)}{dz_t} = (d - 1)(1 - \tau_t) \geq 0,$$  \hspace{1cm} (4.8)

since $d > 1$ and $\tau_t \in [0,1]$. The first-order holds with equality when $\tau_t = 1$ leaving an entrepreneur indifferent between investing and non-investing her endowment in the entrepreneurial technology. For any $\tau_t \in [0,1]$, there is a corner solution for which the entrepreneur invests her entire endowment in it.$^3$

This implies the optimal level of investment undertaken by each entrepreneur is $z^*_t = 1$ for any given $\tau_t \in [0,1]$.

### 4.3.3 Labour market

There are three conditions that are key to determining the labour demand and labour supply schedules. Two of these conditions involve comparing the income of a rich agent obtained from being an entrepreneur versus her income in a different occupation, worker and subsister respectively. The third condition involves the comparison of the income of a poor agent obtained from being a worker versus her income as a subsister. It will be shown that this third condition is identical for both and rich agents.

The condition that leaves a rich agent indifferent between becoming an entrepreneur and a worker is given by:

$$d(1 - \tau_t) - w_t = w_t - (1 - \tau_t),$$  \hspace{1cm} (4.9)

which more succinctly may be re-written as: $w_t = \frac{1}{2}(d + 1)(1 - \tau_t)$.

Similarly, the condition that leaves a rich agent indifferent between an entrepreneur and a subsister is given by:

$$d(1 - \tau_t) - w_t = (1 - \tau_t)w + \tau_t\frac{\alpha}{a^*_t} - (1 - \tau_t)$$  \hspace{1cm} (4.10)

$^3$It is assumed that an entrepreneur, if for any unit of her endowment is indifferent between investing it as capital in the entrepreneurial technology and leaving it idle, invests it into the entrepreneurial technology.
The condition that leaves a poor agent indifferent between becoming a worker and a subsister is given by:

\[ w_t = (1 - \tau)w + \tau \frac{a^S}{a_t} \]  \hspace{1cm} (4.11)

where \( a^S \) is the endogenously determined share of subsisters in the economy. If the term \((1 - \tau)\) is added to both sides, this becomes to condition that leaves a rich agent indifferent between becoming a worker and a subsister. This condition implies that a a worker is paid their outside option as modelled in Ghatak and Jiang (2002).\(^4\)

**Assumption 2.** If \( y_t^E(w, \tau|e_t = 1) = y_t^W(w, \tau|e_t = 1) \) or \( y_t^E(w, \tau|e_t = 1) = y_t^S(w, \tau|e_t = 1) \), I assume in each case a rich agent becomes an entrepreneur.

Next, I proceed to characterizing the labour demand and the labour supply scheduled respectively. The labour supply schedule is given by:

\[
L_{t}^S = \begin{cases} 
0 & \text{if } w_t < (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \\
[0, \alpha] & \text{if } w_t = (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \text{ and } w_t < \frac{1}{2}(d + 1)(1 - \tau_t) \\
\alpha & \text{if } w_t = (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \text{ and } w_t \geq \frac{1}{2}(d + 1)(1 - \tau_t) \\
[\alpha, 1 - \alpha] & \text{if } w_t = (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \text{ and } w_t < \frac{1}{2}(d + 1)(1 - \tau_t) \\
1 - \alpha & \text{if } w_t > (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \text{ and } w_t < \frac{1}{2}(d + 1)(1 - \tau_t) \\
1 & \text{if } w_t > (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \text{ and } w_t \geq \frac{1}{2}(d + 1)(1 - \tau_t)
\end{cases}
\]

and the labour demand schedule is given by:

\( \text{Note that } L_{t}^S \in [0, 1 - \alpha] \) if \( w_t = (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \text{ and } w_t < \frac{1}{2}(d + 1)(1 - \tau_t) \) and \( L_{t}^S = \alpha \) if \( w_t = (1 - \tau_t)w + \tau_t \frac{a^S}{a_t} \text{ and } w_t \geq \frac{1}{2}(d + 1)(1 - \tau_t). \) Therefore, \( L_{t}^S = \alpha \) may arise regardless of the sign in the condition \( w_t < \frac{1}{2}(d + 1)(1 - \tau_t). \)
Proposition 1. The labour demand and labour schedules imply that there are two labour market equilibria depending on the parametric restrictions. The first equilibrium is given by

\[ L^D_t = \begin{cases} 0 & : \text{if } d(1 - \tau_t) - w_t < \max\{w_t, (1 - \tau_t)w + \tau_t \alpha \} + (1 - \tau_t) \\ \alpha & : \text{if } d(1 - \tau_t) - w_t \geq \max\{w_t, (1 - \tau_t)w + \tau_t \alpha \} + (1 - \tau_t) \end{cases} \]

Proposition 1. The labour demand and labour schedules imply that there are two labour market equilibria depending on the parametric restrictions. The first equilibrium is given by

\[ L^*_t = \alpha \] and a corresponding equilibrium wage \( w^*_t = (1 - \tau_t)w + \tau_t \alpha \frac{1}{1 - 2\alpha} \) giving rise to an occupational distribution \( \Gamma(\alpha_S, \alpha_W, \alpha_E) = \Gamma(1 - 2\alpha, \alpha, \alpha) \).

The second equilibrium is given \( L^*_t = 0 \), which can be supported by an equilibrium wage \( w^*_t \in [0, (1 - \tau_t)w + \tau_t \alpha \frac{1}{1 - 2\alpha}] \) giving rise to an occupational distribution \( \Gamma(\alpha_S, \alpha_W, \alpha_E) = \Gamma(1, 0, 0) \).

Proof:

The first equilibrium is determined by the intersection of the labour demand and the labour supply schedules at \( L^D_t = L^S_t = \alpha \), which is satisfied for

\[ y^E_t |(e_t = 1) \geq y^W_t |(e_t = 1) = y^S_t |(e_t = 1) \]

and

\[ y^W_t |(e_t = 0) = y^S_t |(e_t = 0) \].

The equilibrium wage is determined by the outside option of a poor agent, which is the income of a subsister. This equilibrium holds as long as the following condition is satisfied:

\[ d(1 - \tau_t) \geq 2[(1 - \tau_t)w + \tau_t \alpha \frac{1}{1 - 2\alpha} - (1 - \tau_t)]. \tag{4.12} \]

The second equilibrium is determined by the intersection of the labour demand and the labour supply schedules at \( L^D_t = L^S_t = 0 \), which is satisfied if the equilibrium wage \( w_t^* \) is such that:

\[ y^S_t |(e_t = 1) > \max\{y^W_t |(e_t = 1), y^S_t |(e_t = 1)\} \]

and

\[ y^S_t |(e_t = 0) \geq y^W_t |(e_t = 0) \].

QED

Corollary 1. The labour market equilibrium condition and the condition leaving non-constrained individual indifferent between occupations implies the theft rate, at which entrepreneurs are indifferent is given by:

\[ \hat{\tau} = \frac{(d - 1) - 2w}{2 \frac{\alpha}{1 - 2\alpha} + (d - 1) - 2w} \in [0, 1]. \tag{4.13} \]

To solve for the threshold \( \hat{\tau} \), I compare the incomes of an entrepreneur and a worker that could be earned by a rich agent:

\[ q(1 - \hat{\tau}, z^* = 1) - w^*(\hat{\tau}) = w^*(\hat{\tau}) - (1 - \hat{\tau}) \tag{4.14} \]
CHAPTER 4. ENDOGENOUS PROPERTY RIGHTS IN A DEMOCRACY

Next, I use $q(1 - \hat{\tau}, z^* = 1) = d(1 - \hat{\tau})$ and $w^*(\hat{\tau}) = (1 - \hat{\tau})w + \hat{\tau}\frac{\alpha}{1 - 2\alpha}$:

$$(d - 1)(1 - \hat{\tau}) = 2((1 - \hat{\tau})w + \hat{\tau}\frac{\alpha}{1 - 2\alpha})$$  \hspace{1cm} (4.15)

Isolating for $\hat{\tau}$ yields:

$$\hat{\tau} = \frac{(d - 1) - 2w}{2\frac{\alpha}{1 - 2\alpha} + (d - 1) - 2w} \in [0, 1)$$  \hspace{1cm} (4.16)

since $\frac{2\alpha}{1 - 2\alpha} > 0$.

**Corollary 2.** For sufficiently low productivity differential $\frac{d - 1}{w} \leq 2$ between the the entrepreneurial and the subsistence technologies for a given endowment distribution $\{1, 0; \alpha, 1 - \alpha\}$, rich agents become entrepreneurs only when property rights are perfectly enforced. If the ex-post inequality generated by the two technologies exceeds this threshold, i.e. $\frac{d - 1}{w} > 2$, each rich agent is willing to become an entrepreneur for some positive range of the theft rate.

**Corollary 3.** The threshold level $\hat{\tau}$ is:

1. positively related to the subsistence wage

$$\frac{d\hat{\tau}}{dw} = \frac{4\frac{\alpha}{1 - 2\alpha}}{(2\frac{\alpha}{1 - 2\alpha} + (d - 1) - 2w)^2} > 0$$  \hspace{1cm} (4.17)

2. negatively related to the productivity parameter $d$ of the entrepreneurial technology

$$\frac{d\hat{\tau}}{dd} = -\frac{2\frac{\alpha}{1 - 2\alpha}}{(2\frac{\alpha}{1 - 2\alpha} + (d - 1) - 2w)^2} < 0$$  \hspace{1cm} (4.18)

An improvement in the efficiency of the entrepreneurial technology relative to the subsistence technology increases the ex-post inequality between entrepreneurs, on one hand, and workers and subsisters, on the other. This disparity can also be interpreted as the difference between an entrepreneur’s income and her outside option. A higher efficiency parameter, $d$, implies the threshold theft rate $\hat{\tau}$ increases, i.e. each rich agent is willing to accept an even higher fraction of her endowment being stolen and still voluntarily become an entrepreneur.

3. positively related to the fraction of non-constrained agents $\alpha$ in the economy
A larger fraction of rich agents, when all of them become entrepreneurs, implies there is a greater pool of agents from whom assets are being taken away form and a smaller pool of agents to whom the benefits of stealing are being distributed to.

The changes in each of the above exogenous factors could have a meaningful interpretation in explaining how the necessary conditions for the increased frequency of land invasions in Quito, Ecuador, were created. Burgwal (1995) and Dosh (2010) discuss government policies that increased the productivity in the entrepreneurial sector $d$ and also decreased $w$ in the subsistence sector if $w$ is given the interpretation of a minimum wage or its rate be at least partly some form of government assistance for the poor. Furthermore, there was an exogenous increase of poor agents from rural areas that reduced the relative fraction of entrepreneurs in the economy $\alpha$. The changes in $d$ and $w$ could be interpreted to have exacerbated income inequality, while the exogenous increase in $\alpha$ to have led to an decrease of the poor agents relative to rich agents. To observe the combined effect of these three individual effects, consider a minor transformation of:

$$\frac{d\hat{\tau}}{d\alpha} = -\frac{(d-1) - 2w}{2\frac{\alpha}{1-2\alpha} + (d-1) - 2w} \frac{2(1-4\alpha)}{2(1-2\alpha)^2} > 0$$ (4.19)

The term $\frac{d-1}{W}$ clearly increases when $d$ increases but $w$ decreases. The term $\frac{1}{W}\frac{\alpha}{1-2\alpha}$, however, is ambiguous. However, suppose $w$ is interpreted to have 'plummeted', while $\alpha$ to have increased only 'moderately' due to migrant population such that the term $\frac{1}{W}\frac{\alpha}{1-2\alpha}$ overall decreases. This would imply $\hat{\tau}$ has also increased unless there is a corner solution, while subsisters face an altered trade-off between stealing and working at the subsistence wage. If the changes in these exogenous factors are sufficiently large, the set of government policies could have, paradoxically, created the necessary conditions for poor property rights to arise - subsisters strictly preferring stealing to working in the subsistence sector, while non-constrained agents still preferring to becoming entrepreneurs for 'moderate' levels of stealing, i.e. $\tau \leq \hat{\tau}$.

**Corollary 4.** Any positive amount of stealing increases the outside option for workers by

---

6Note $v(\alpha) = \frac{\alpha}{1-2\alpha}$ is a strictly increasing function of $\alpha$ as $\frac{dv(\alpha)}{d\alpha} = -\frac{1}{(1-2\alpha)^2} > 0$. 

---
the amount $\tau(\frac{\alpha}{a_S} - w)$. In equilibrium, the equilibrium wage increases in a one-to-one ratio with this amount such that $y^S(\tau) = y^W(\tau)$ for any $\tau$.

The net cost each entrepreneur incurs due to stealing is:

$$NC^E(\tau) = d\tau + (w^*(\tau) - w)$$ (4.21)

where the first term of the RHS is the direct loss incurred due to stealing and the second term of the RHS is the externality effect measuring the extra amount paid to a worker in excess of the subsistence wage. Substituting for the equilibrium wage for an economy where subsisters steal from workers and entrepreneurs only yields:

$$NC^E(\tau) = d\tau + \tau\left(w + \frac{\alpha}{1 - 2\alpha} - w\right)$$ (4.22)

$$NC^E(\tau) = \tau d\left(1 - \frac{2\alpha}{1 - 2\alpha}\right)$$ (4.23)

4.4 Property rights and political institutions

4.4.1 Political representation

Each occupational group has a political representation denoted by the Party of Subsisters $PS$, the Party of Workers $PW$, and the Party of Entrepreneurs $PE$ in the legislature who care about the total income generated from their membership.

$$U_{Pi}(\tau) = t\{a^1_i y^1_i(\tau) + a^2_i(\tau)y^2_i(\tau)\}, \text{ where } i = \{S, W, E\},$$ (4.24)

Assumption 3. In exchange for representing their members’ interests at the political stage, each political party levies a proportional income membership dues at a fixed rate $t$ invariant across political parties.

This levy on members’ income aligns the interests of the membership to those of their representative for a fixed membership size. This levy also has the advantage of being non-distortionary. It is effectively a ‘tax on profits’, net of any costs agents incur and also identical across occupations.

Each political party has some control over $\tau$, which will be explicitly specified when laying out the rules governing the legislative bargaining process. Through $\tau$, each political
party can indirectly influence the per member income in each period \( y_i^1(\tau) \) and \( y_i^1(\tau) \) as well as its respective membership size in the second period \( a_i^2(\tau) \). Each political party takes their respective membership size in the first period as given \( a_i^1(\tau) \).

This specification of political preferences’ generates the following trade-off faced by each political party: a political party might be willing to increase (decrease) per member income each period at the expense of (in favour of) smaller (greater) membership size in the second period.

Next, I describe the properties of each of the political parties’ payoff functions. Each of them depends on the occupational distribution \( \Gamma(a^{S}, a^{W}, a^{E}) \) that has arisen in the occupational stage. As already shown in the labour market, a theft rate \( \tau \in [0, \hat{\tau}] \) can support an occupational distribution \( \Gamma_1(1 - 2\alpha, \alpha, \alpha) \), while a theft rate \( \tau \in (\hat{\tau}, 1] \) can support an occupational distribution \( \Gamma_1(1, 0, 0) \). The payoffs of each political party can be characterized by a piecewise-defined function.

**PE’s Payoffs:**

\[
U^{PE}(\tau) = \begin{cases} 
  t(\alpha y_1^E(\tau) + \alpha y_2^E(\tau)) & : \text{if } \tau \in [0, \hat{\tau}] \\
  0 & : \text{if } \tau \in (\hat{\tau}, 1],
\end{cases}
\]

where \( y_i^t = d(1 - \tau) - (1 - \tau)w - \tau \frac{\alpha}{1 - 2\alpha} \) in \( t = \{1, 2\} \) for \( \tau \in [0, \hat{\tau}] \). The Party of the Entrepreneurs as well as the Party of the Workers have no membership, i.e. \( a^{W} = a^{E} = 0 \) for \( \tau \in (\hat{\tau}, 1] \).

\[
\frac{dU^{PE}}{d\tau} = \begin{cases} 
  2t\alpha \{-d + w - \frac{\alpha}{1 - 2\alpha}\} < 0 & : \text{if } \tau \in [0, \hat{\tau}] \\
  0 & : \text{if } \tau \in (\hat{\tau}, 1],
\end{cases}
\]

At \( \hat{\tau} \), there is a jump discontinuity of size \(-2t\alpha \{d(1 - \hat{\tau}) - (1 - \hat{\tau})w - \hat{\tau} \frac{\alpha}{1 - 2\alpha}\} < 0 \) due to the discontinuous drop in \( a_i^E \) from \( \alpha \) to 0. This implies \( U^{PE}(\tau) \) achieves a maximum at \( \tau = 0 \).

Note that the interpretation of the derivative is only defined for \( \tau \leq \tau^{sq} \) due to the downward revision restriction imposed in the political stage.

**PS’s Payoffs:**
$U^{PS}(\tau) = \begin{cases} 
  t(1 - 2\alpha)\{y_1^S(\tau) + y_2^S(\tau)\} & \text{if } \tau \in [0, \hat{\tau}] \\
  t\{y_1^S(\tau) + y_2^S(\tau)\} & \text{if } \tau \in (\hat{\tau}, 1], 
\end{cases}$

where $y_t^S = (1 - \tau)w + \tau \alpha \frac{1}{1 - 2\alpha}$ for $t = \{1, 2\}$ if $\tau \in [0, \hat{\tau}]$ and the average income of a subsister\(^7\) for $t = \{1, 2\}$ if $\tau \in (\hat{\tau}, 1]$ is given by $y_t^S = (1 - \tau)w + \alpha$. The special treatment of this case arises because all agents are subsisters and the Party of the Subsisters collects a constant fraction of the endowment that is independent of $\tau$.

$PS$’s utility is strictly increasing in $\tau$ for $\tau \in [0, \tau_E]$ because

$$\frac{dU^{PS}}{d\tau} = \begin{cases} 
  (1 - 2\alpha)t\{\frac{\alpha}{1 - 2\alpha} - w\} > 0 & \text{if } \tau \in [0, \hat{\tau}] \\
  0 & \text{if } \tau \in (\hat{\tau}, 1]. 
\end{cases}$$

For the case $\tau \in (\hat{\tau}, 1]$, $\frac{dU^{PS}}{d\tau} = 0$ because the Party of the Subsisters loses income in period 1 from a decrease in $\tau$, which is exactly gained back in the second period by constraining the subsisters not to allocate more than a fraction $\tau$ of their time to stealing in the second period.

At $\hat{\tau}$, there is a jump discontinuity due to the discontinuous increase in the payoff of size $(1 - \tau)w(2\alpha - 1) > 0$. This implies that $U^{PS}$ achieves a maximum for any $\tau \in (\hat{\tau}, 1]$.

$PW$’s Payoffs:

$$U^{PW}(\tau) = \begin{cases} 
  \alpha t\{y_1^W(\tau) + y_2^W(\tau)\} & \text{if } \tau \in [0, \hat{\tau}] \\
  0 & \text{if } \tau \in (\hat{\tau}, 1], 
\end{cases}$$

where $y_1^W = (1 - \tau^q)w + \tau \alpha \frac{1}{1 - 2\alpha}$ and $y_2^W = (1 - \tau)w + \tau \alpha \frac{1}{1 - 2\alpha}$. Note that $\frac{dy_1^W}{d\tau} = \frac{\alpha}{1 - 2\alpha} > 0$ and $\frac{dy_2^W}{d\tau} = -w + \alpha \frac{1}{1 - 2\alpha} > 0$ for any $\tau \in [0, 1]$.

$$\frac{dU^{PW}}{d\tau} = \begin{cases} 
  2\alpha t\{\frac{\alpha}{1 - 2\alpha} - w\} > 0 & \text{if } \tau \in [0, \hat{\tau}] \\
  0 & \text{if } \tau \in (\hat{\tau}, 1] 
\end{cases}$$

At $\hat{\tau}$, there is a jump discontinuity of size $2\alpha t\{1 - \tau\}w + \frac{\alpha}{1 - 2\alpha} > 0$ due to the discontinuous drop in $a_t^W$ from $\alpha$ to 0. This implies $U^{PW}(\tau)$ achieves a maximum at $\tau = \hat{\tau}$.

\(^7\)All agents, poor and rich, self-select as subsisters. All subsisters possess the entire endowment $\alpha$ in the economy.
4.4.2 Legislative Bargaining

I employ a game-theoretic open-rule legislative bargaining model to allow for the possibility of a coalition formation in the political stage. A key feature of this model is the endogenous status quo policy $\tau^{sq}$ determined in the economic stage, which is trivially implied by the fraction of time a subsister devotes to stealing.

I assume an open-rule bargaining process, where the political stage proceeds into two stages: initial and amendment.\(^8\) In the initial stage, a political party is randomly assigned the proposal power, and also referred to as the agenda setter, with a probability equal to the relative size of its membership. The agenda setter seeks the support of at least one more political party such that the proposal acquires a majority support in the legislature, the one that is cheapest to buy a la Bertrand competition. The agenda setter and its coalition partner form what is known in the literature as the Minimum Winning Coalition (MWC). The agenda setter offers a theft rate that maximizes its own payoff within the set of policies its coalition partner will be at least as well off relative to the default.

The default in the amendment stage is the status quo policy $\tau^{sq}$, while the default in the initial stage is the expected utility from moving the game to the amendment stage. If the MWC votes in favour of the proposed policy against the default policy, the proposed policy is implemented. If the proposal fails in the initial stage, the game moves to the amendment stage where one of the other two political parties is randomly assigned the proposal power (i.e. being the agenda setter). The probability of being the agenda setter is equal to the ratio of: (numerator) the share of a party’s membership that did not have the proposal power in the initial stage relative to that of the two parties that did not have the proposal power in the initial stage. For instance, if $PS$ has the proposal power in the initial stage, $PW$ will have the proposal power in the amendment stage with probability $\frac{a^W}{a^W + a^E}$ and $PE$ will have the proposal power in the amendment stage with the remaining probability $\frac{a^E}{a^W + a^E}$. The game proceeds in the same manner except that the status quo policy is implemented in the

\(^8\)The distinction between open-rule versus closed-rule legislative bargaining has gained practical application due to the switch of the US Congress towards imposing some restrictions on the ability to amend initial proposals. Frechette et al. (2003) quote evidence collected by Sinclair (1995) that in the 95th Congress (1977-1978) 15 % of the bills were subject to restrictive rules. This figure steadily increased to 66 % in the 102th Congress (1991-1992). The political economics literature has studied several implications arising from the nature of legislative bargaining, some of which are reported in Frechette et al. (2003). In particular, Barron (1991) argues that open amendment rule limit inefficient pork-barrel legislation relative to closed amendment rules. Furthermore, Alesina and Perotti (1996) argue that open versus closed amendment rules have implications for whether or not national governments run balances budgets, along with the overall composition of those budgets.
case the proposed policy is defeated. This results in two distinct decisions problems.

In the amendment stage, political parties have the option to seek the protection of the status quo in case the political party that is cheapest to buy would result in a payoff lower than that under the status quo policy. This in case there was a single stage would have been problematic since the proposal power is randomly determined and in general agenda setters tend to capture a disproportionate amount of the rents. This issue would have been further exacerbated in this model. This is because the subsisters could have a monopoly power over the determination of the theft rate: directly, at the economic stage, and indirectly, through their political representative at the political stage.

In the initial stage, however, the political parties face a completely different problem. They are maximizing their expected political party utility (not that of their voters) over the permissible range of the theft rate, where expectations are based on the probabilities and outcomes of each branch of the tree if the game moves to the amendment stage. What each party tried to improve on is not the status quo policy but the expected utility from the implemented policies at the amendment stage.

**Assumption 4.** It is assumed that the legislature is able to revise the status quo theft rate \( \tau^{sq} \) only downwards, i.e. \( \tau \leq \tau^{sq} \).

In this context, I refer to equilibrium values of \( \tau = 0 \) as perfect enforcement of property rights and to equilibrium values of \( \tau > 0 \) as imperfect enforcement of property rights.

**Assumption 5.** The restoration of property rights on the endowment is assumed to be a costless transfer of resources from one group of agents to another.

### 4.4.3 Political Parties’ Optimization Problem

#### Initial Stage

Next, I describe the optimization problem faced the Party of the Subsisters, without loss of generality, in the initial stage, where each political party takes the expected value of moving the game into the amendment stage as the default policy.

\[
\max_{\tau, c} U^{PS}(\tau) = a^S(\tau)y^S(\tau)
\]  

(4.25)
subject to

\[
U_{PS}(\tau) = a^S(\tau)y^S(\tau) \geq \frac{a^W}{a^W + a^E}U_{PS}(\tau|N^{AS} = PW) + \frac{a^E}{a^W + a^E}U_{PS}(\tau|N^{AS} = PE)
\]

\[
U_{PW}(\tau) = a^W(\tau)y^W(\tau) \geq \frac{a^W}{a^W + a^E}U_{PW}(\tau|N^{AS} = PW) + \frac{a^E}{a^W + a^E}U_{PW}(\tau|N_t^{AS} = PE)
\]

\[
U_{PE}(\tau) = a^W(\tau)y^W(\tau) \geq \frac{a^W}{a^W + a^E}U_{PE}(\tau|N^{AS} = PW) + \frac{a^E}{a^W + a^E}U_{PE}(\tau|N^{AS} = PE)
\]

\[
0 \leq \tau \leq \tau^{sq}
\]

\[
c = \begin{cases} 
PW & : \text{if } U_{PS}(\tau^*|c = PW) > U_{PS}(\tau^*|c = PE) \\
PE & : \text{if } U_{PS}(\tau^*|c = PW) < U_{PS}(\tau^*|c = PE) \\
\{PW, PE\} & : \text{if } U_{PS}(\tau^*|c = PW) = U_{PS}(\tau^*|c = PE) 
\end{cases}
\]

PS’s objective is to maximize its payoff by choosing a theft rate \( \tau \) and a coalition partner \( c \) such that the chosen theft rate will leave PS and the coalition partner of its choice at least as well off as if game were moved to the amendment stage. The first constraint indicates that PS would choose \( \tau \) such that PS is at least as well off as under the status quo policy. The next two constraints are the participation constraints of its potential coalition partners PW and PE respectively, where the default policy is the expected payoff from moving the game to the amendment stage. In these two constraints, \( \frac{a^W}{a^W + a^E} \) and \( \frac{a^W}{a^W + a^E} \) are the probabilities of PW and PE respectively being assigned the proposal power as the agenda setter N^{AS} in the amendment stage. Of these two constraints, PS needs to satisfy the constraint(s) only for the cheapest to buy coalition partner(s) \( c \) such that the proposed policy acquires a majority vote in the legislature. The last constraint indicates the circumstances under which PS would choose either PW or PE or both as coalition partner(s) \( c \) in order to maximize its payoff. The first line reads PS will choose \( c = PW \) provided that the payoff-maximizing theft rate \( (\tau^*|c = PW) \) if PW were its coalition partner (PW’s participation constraint is satisfied) leaves PS better off relative to the payoff-maximizing theft rate \( (\tau^*|c = PE) \) if PE were its coalition partner (PE’s participation constraint is satisfied). The choice of a coalition partner from this constraint determines whether PS will need to satisfy PW’s participation constraint or PE’s participation constraint or both. The last constraint \( 0 \leq \tau \leq \tau^{sq} \) denotes the downward revision assumption.
Amendment Stage

Without loss of generality, the optimization problem of the political party of the subsisteners is given by:

$$\max_{\tau, c} U^{PS}(\tau) = a^S_1 y^S_1(\tau) + a^S_2(\tau)y^S_2(\tau)$$  \hspace{1cm} (4.30)$$

subject to:

$$U^{PS}(\tau) = a^S_1 y^S_1(\tau) + a^S_2(\tau)y^S_2(\tau) \geq a^S_1 y^{Sq}_1(\tau) + a^S_2(\tau^{sq})y^S_2(\tau^{sq}) = U^{PS}(\tau^{sq})$$  \hspace{1cm} (4.31)$$

$$U^{PW}(\tau) = a^W_1 y^W_1(\tau) + a^W_2(\tau)y^W_2(\tau) \geq a^W_1 y^{Wq}_1(\tau) + a^W_2(\tau^{sq})y^W_2(\tau^{sq}) = U^{PW}(\tau^{sq})$$  \hspace{1cm} (4.32)$$

$$U^{PE}(\tau) = a^E_1 y^E_1(\tau) + a^E_2(\tau)y^E_2(\tau) \geq a^E_1 y^{Eq}_1(\tau) + a^E_2(\tau^{sq})y^E_2(\tau^{sq}) = U^{PE}(\tau^{sq})$$  \hspace{1cm} (4.33)$$

$$c = \begin{cases} 
PW & : \text{if } U^{PS}(\tau^*|c = PW) > U^{PS}(\tau^*|c = PE) \\
PE & : \text{if } U^{PS}(\tau^*|c = PW) < U^{PS}(\tau^*|c = PE) \\
\{PW, PE\} & : \text{if } U^{PS}(\tau^*|c = PW) = U^{PS}(\tau^*|c = PE) \text{ and } \tau^*|c = PW \equiv \tau^*|c = PE
\end{cases}$$

$$0 \leq \tau \leq \tau^{sq}$$  \hspace{1cm} (4.34)$$

PS’s objective is to maximize its utility by choosing a theft rate $\tau$ and a coalition partner $c$ such that the chosen theft rate will leave PS and the coalition partner of its choice at least as well off as if the status quo policy were implemented. All constraints are as those described in the initial stage except that the participation constraints use the status quo policy instead of the expected policy implemented in the amendment stage as the outside option.
4.5 Efficient Allocations

Social Planner’s Problem:

A benevolent social planner maximizes a utilitarian social welfare function that assigns occupational status to each agent \{E, W, S\}, sets the theft rate for subsisters and allocates how much of each entrepreneur’s endowment to be invested into the entrepreneurial technology. The occupational shares of entrepreneurs, workers, and subsisters are denoted by \(a^E_t\), \(a^W_t\), and \(a^S_t\) respectively.

\[
\max_{a^i_t, z_t, \tau_t} SW = a^E_t y^E_t + a^W_t y^W_t + a^S_t y^S_t, \text{ for } i = \{E, W, S\} \tag{4.35}
\]

subject to the resource constraint:

\[
a^E_t |(e_t = 1) + a^W_t |(e_t = 1) + a^S_t |(e_t = 1) \leq \alpha, \tag{4.36}
\]

where the right-hand side represents the aggregate endowment \(\alpha\) in the economy, while the left-hand side represents how the aggregate endowment is distributed across occupations.

and also to the occupational distribution constraint:

\[
a^E_t + a^W_t + a^S_t = 1. \tag{4.37}
\]

The social planner takes the endowment structure in the economy as given.

\[
\max_{a^i_t, z_t, \tau_t} SW = a^E_t \left\{d(1 - \tau_t)z_t + (1 - \tau_t)(1 - z_t)\right\}
+ a^W_t \left\{1_{e_t = 1}(1 - \tau_t)\right\}
+ a^S_t \left\{\frac{\tau \alpha}{a^S_t} + (1 - \tau_t)w + 1_{e_t = 1}(1 - \tau_t)\right\} \tag{4.38}
\]

subject to:

\[
a^E_t |(e_t = 1) + a^W_t |(e_t = 1) + a^S_t |(e_t = 1) \leq \alpha, \tag{4.39}
\]

\[
a^E_t + a^W_t + a^S_t = 1. \tag{4.39}
\]
The solution to the social planner’s problem proceeds in multiple steps:

First, the social planner realizes $\tau_t \alpha$ is a transfer of wealth from entrepreneurs to subsisters that reduces $SW$ by $\tau_t[w + (d - 1)]$ due to the opportunity cost of stealing incurred in the subsistence sector $\tau_t w$ and in the entrepreneurial sector $\tau_t (d - 1)$. The social planner minimizes this loss by setting $\tau_t = 0$.

The social planner’s problem then reduces to:

$$\max_{a_t^E, z_t, \tau_t} SW = a_t^E \{dz_t + (1 - z_t)\} + a_t^W (1_{e_t=1}(1)) + a_t^S (w + 1_{e_t=1}(1)) \quad (4.40)$$

subject to:

$$a_t^E(e_t = 1) + a_t^W(e_t = 1) + a_t^S(e_t = 1) \leq \alpha, \quad (4.41)$$

$$a_t^E + a_t^W + a_t^S = 1. \quad (4.42)$$

Secondly, when $\tau_t = 0$ the social planner maximizes output from the entrepreneurial technology by setting $z_t^* = 1$ since $\frac{d(z_t + (1 - z_t))}{dz_t} > 0$ for any $z \in [0, 1]$.

Third, the social planner chooses the occupational shares. He finds it optimal to set $a_t^E = a_t^W$ since the modern technology uses entrepreneurs and workers into a 1 : 1 ratio. If $a_t^E < a_t^W$, there are idle workers of size $(a_t^W - a_t^E)w$ who could have increased $SW$ by $(a_t^W - a_t^E)w$ if they were subsisteners instead. Similarly, if $a_t^E > a_t^W$ there are idle entrepreneurs of size $(a_t^E - a_t^W)$ who could have increased $SW$ by $(a_t^E - a_t^W)w$ if they were assigned the occupational status of subsisters instead.

By assumption, the entrepreneurial technology is more productive than the subsistence technology for $q(z_t = 1) > 2w$. For the socially optimal $\tau_t = 0$ and $z_t^* = 1$, an entrepreneur can generate: $y_t^E (z_t = 1) = q(z_t = 1) - w > w = y_t^S (z_t = 1)$, where the term $(-w)$ is the opportunity cost of allocating one agent from subsistence to the workers’ occupation. Therefore, it is socially optimal to set the fraction of entrepreneurs equal to the fraction of rich individuals in the economy $a_t^E = \alpha$ such that all rich individuals become entrepreneurs.

The above results yield the efficient occupational distribution: $\Gamma(a_t^S, a_t^W, a_t^E) = \Gamma(1 - 2\alpha, \alpha, \alpha)$ and allocations $z_t = 1, \tau_t = 0$. 
4.6 Equilibrium

Proposition 2. The unique equilibrium theft rate is \( \tau^e_q = \tau^a_q = \hat{\tau} \) that supports an occupational distribution \( \Gamma_2^*(a_2^S, a_2^W, a_2^E) = \Gamma_2(1 - 2\alpha, \alpha, \alpha) \) and \( y_2^E(\hat{\tau}) = y_2^W(\hat{\tau}) = y_2^S(\hat{\tau}) = (1 - \hat{\tau})w + \hat{\tau} \frac{\alpha}{1 - 2\alpha}. \)

Proof:

Period 2:

In the economic stage, the only constraint for a subsister is the value of the equilibrium theft rate determined in the political stage in period 1, i.e. each subsister can choose to allocate a fraction of their time \( \tau \in [0, \tau^e_q] \). Given this constraint, each subsister chooses \( \tau^*_2 = \tau^e_q \), which determines the subgame equilibrium theft rate for this occupational distribution in period 2. Also, each entrepreneur allocates her entire time endowment to supervision and invests her entire endowment \( z^*_2 = 1 \) since \( q(z) = dz > z \) and each worker allocates her entire time endowment to working. The equilibrium wage is the one derived in Section 3.3.

Having determined the theft rate in the economic decision stage, I turn to the agents’ occupational choice decision. For a political equilibrium theft rate \( \tau^e_q \in [0, \hat{\tau}] \), each rich agent compares the income she would receive from each of the three occupations in the economic stage. She optimally selects herself into the occupation, in which she could earn the highest income. Foreseeing that each subsister will choose \( \tau^*_2 = \tau^e_q \geq \hat{\tau} \), all rich agents of size \( \alpha \) self-select as entrepreneurs. Based on the argument developed in Section 3.3., a fraction \( \alpha \) of the agents become workers and the remainder \( 1 - 2\alpha \) subsisters.

For a political equilibrium theft rate \( \tau^e_q \in (\hat{\tau}, 1] \), each agent foresees that each subsister chooses \( \tau^*_2 = \tau^e_q \). Consequently, all rich agents, based on the argument developed in Section 3, choose to become subsisters as they would be worse off choosing a different occupation. All poor agents also become subsisters as there are no agents. The resulting subgame equilibrium occupational distribution is: \( \Gamma_2^*(a_2^S, a_2^W, a_2^E) = \Gamma_2(1, 0, 0). \)

Period 1:

Political stage:

For \( \tau^e_q \in [0, \hat{\tau}] \) the implemented policy in each subgame of the original game is \( \tau^e_q = \tau^a_q \) regardless which party has the proposal power. Note the game is never moved to the amendment stage but the two-stage political structure serves an important purpose by not
allowing the party randomly assigned proposal power to have superior bargaining power relative to the other parties. This part of the proof is relegated to the appendix.

For \( \tau^{sq} \in (\hat{\tau}, 1] \), there are two possible outcomes: if the implemented expected policy \( E(\tau^{eq}) \in (\hat{\tau}, 1] \), this policy is only consistent with an occupational distribution \( \Gamma_1(1, 0, 0) \) and thus inconsistent with an occupational distribution \( \Gamma_1(1 - 2\alpha, \alpha, \alpha) \); if the implemented expected policy \( E(\tau^{eq}) \in (0, \hat{\tau}] \), this policy would result in at least the partial return of the endowment to the rich agents. It remains to be shown that \( \tau^{sq} \in (\hat{\tau}, 1] \) cannot be on the equilibrium path of the original game because either \( \Gamma_1(1, 0, 0) \) will not arise or subsisters will not find it in their self-interest to allocate a fraction of their time \( \tau^{sq} \in (\hat{\tau}, 1] \).

Economic stage:

For an occupational distribution \( \Gamma_1(a^S_1, a^W_1, a^E_1) = \Gamma_1(1, 0, 0) \), and correctly anticipating no (partial or complete) restoration of original property rights in the political stage, each subsister optimally chooses \( \tau^*_1 = 1 \). This is because each subsister rationally expects its representative the Party of the Subsisters, the only party representing in the legislature for this occupational distribution, to not restore original property rights since it constitutes a mere transfer of resources from some of its members to others, thus leaving PS’s income unaffected. Each subsister’s optimal choice also trivially determines the status quo policy in the legislative bargaining \( \tau^{sq} = \tau^*_1 = 1 \) associated with this occupational distribution.

For an occupational distribution \( \Gamma_1(a^S_1, a^W_1, a^E_1) = \Gamma_1(1 - 2\alpha, \alpha, \alpha) \) I solve the subsister’s problem by analyzing two ranges of \( \tau: \tau^{sq} \in \big[0, \hat{\tau}\big] \) and \( \tau^{sq} \in (\hat{\tau}, 1] \). This is necessary because each of these intervals leads to a different solution with respect to the restoration of property rights in the political stage. Each subsister requires this information to form rational expectations about the political equilibrium to arise for each interval.

If I hypothetically restrict \( \tau \in \big[0, \hat{\tau}\big] \), there is a corresponding unique subgame equilibrium \( \mathbf{E}(0 \leq \tau^{eq} \leq \hat{\tau} = a^S_1 \tau^{eq} + a^W_1 \tau^{eq} + a^E_1 \tau^{eq} = (1 - 2\alpha) \tau^{eq} + \alpha \tau^{eq} + \alpha \tau^{eq} = \tau^{eq} \), in the political stage associated with no restoration, which each subsister foresees. Taking into account that a subsister’s income is strictly increasing in \( \tau \), i.e. \( \frac{dy^S_1}{d\tau_1} > 0 \), the optimal choice of a subsister is the highest possible theft rate \( \tau_1 \in [0, \hat{\tau}] \), i.e. \( \tau^*_1|_{(0 \leq \tau_1 \leq \hat{\tau})} = \hat{\tau} \).

Next, I turn to the complement of \( \tau \in \big[0, \hat{\tau}\big] \), that is \( \tau^{eq} \in (\hat{\tau}, 1] \). For an occupational distribution, \( \Gamma_1(1 - 2\alpha, \alpha, \alpha) \), the expected equilibrium theft rate lies in the interval \( \mathbf{E}(\tau^{eq}) \in [0, \hat{\tau}] \), implying that there is at least partial restoration of property rights. Consequently, each subsister realizes that \( \mathbf{E}(\tau^{eq})(\hat{\tau} < \tau \geq 1) < \mathbf{E}(\tau^{eq})(0 \geq \tau \geq \hat{\tau}) = \tau^{eq} \). Taking into account that a subsister’s income is strictly increasing in \( \tau \) and also that for \( \tau^{eq} \in (\hat{\tau}, 1] \).
a subsister would have some of the endowment returned to the rich agents without being compensated for the opportunity cost of foregoing subsistence income, a subsister optimally chooses \( \tau_1^* = \hat{\tau} \).

Occupational choice stage:

Each rich agent correctly anticipates if \( \Gamma_1(1 - 2\alpha, \alpha, \alpha) \) were to arise, each subsister chooses \( \tau_1^* = \hat{\tau} \) and also the equilibrium theft rate in the political stage is \( \tau^{eq} = \hat{\tau} \). This implies \( y^E(\hat{\tau}|e_1 = 1) = y^W(\hat{\tau}|e_1 = 1) = y^S(\hat{\tau}|e_1 = 1) \). Each rich agent compares the income she would receive if she were to be become an entrepreneur versus a subsister: \( y^E(\tau = \hat{\tau}|e_t = 1, \Gamma_1(1 - 2\alpha, \alpha, \alpha)) > y^S(\tau = 1|e_t = 1, \Gamma_1(1, 0, 0)) \). The above inequality implies that each rich agent, knowing that other rich agents also find it in their self-interest to become entrepreneurs, chooses to become an entrepreneur.

QED

Corollary 1. The unique equilibrium theft rate \( \tau^{eq}_t = \tau^{sq}_t = \hat{\tau} \) implies that the equilibrium is inefficient because \( \tau^{eq}_t > 0 \). This inefficient equilibrium, however, sustains the efficient occupational distribution.

4.7 Conclusion

This paper develops an occupational choice model with legislative bargaining features that models the incentives that generate the stealing of assets, modelled as endowment, from one group to another as well as the legitimization of this process through democratic institutions after the fact. The main finding of this paper is that there is a threshold theft rate up to which there is parliamentary support for the legitimization of stealing after the fact. This is driven by the trade-off faced by the occupational group of the workers, who have their income increased for a higher theft rate as their outside option increases but not past the point no rich agents are willing to become entrepreneurs. This result is generated in an environment of costly stealing and costless restoration of assets. Stealing is costly because subsisters have to forgo income earned in the subsistence sector. Introducing legislative bargaining features to the model allows to model the failure of democratic institutions to implement perfect property rights protection. From a technical standpoint, introducing open-rule legislative bargaining with an amendment stage ensures that no single occupational group able to implement the status quo policy without obtaining a majority vote in the legislature, even though in equilibrium the game never moves to the amendment stage.
The second main result of the paper stresses the salience of occupational representation and its impact on the equilibrium theft rate. The poor agents who are ex-ante are identical also end up ex-post identical. However, due to the self-selection of the poor agents into two different occupations, the poor agents end up having different preferences over the theft rate. As a result, the equilibrium theft rate is smaller than the one that would have arisen if all poor agents became subsisters and were represented by a single political party. In this respect, occupational representation serves as a deterrent on the formation of excessively poor property rights protection.

A positive equilibrium theft rate results in an inefficient outcome because some of the endowment is diverted from its most productive use in the modern technology. In the framework of this model, redistributing the output from the modern technology as opposed to the endowment would be more efficient as there is greater aggregate output in the economy. Future work could look into the incentives why less inefficient redistributive policies are not pursued. This prediction of the model could possibly be applied to other issues, where the law is broken and the actions of the offenders are legitimized by a country’s democratic institutions. Such examples could include illegal job actions pursued by trade unions or of the unlawful activities related to illicit drugs.

The positive equilibrium theft rate results in some of the rich agents’ endowment being stolen without any of it being returned to its original owners. This result serves to explain a key stylized fact attributed to organized land invasions in developing countries - squatting on portion of one’s property that is followed by no evictions. Importantly, I demonstrate that this result could be attributed to a country’s democratic institutions as the incentives for implementing such form of redistribution are present.

4.8 References


Chapter 5

Conclusions

The results of the three papers presented in this Thesis shed light on the formation of endogenous formation of political institutions and their impact on public good provision and property rights protection.

In Chapter 2, I studied the effect of form of government on government policy in elections with a small margin of exceeding a threshold. I propose an identification strategy that is suitable for the implementation of a sharp regression discontinuity design for all possible types of pure and mixed proportional electoral systems used in 82 countries. To illustrate the implementation of this identification strategy, I used electoral, census and public finances data from Spanish municipalities in the autonomous region of the Basque Country. I presented causal evidence suggesting that form of government induces a budget electoral cycle in components of per capita expenditure that are visible to the voters and classifiable as local public goods (e.g. road surfacing, water and sewage systems). Relative to coalition governments, single party governments increase the shares of capital outlays and tangible investment to the total budget by additional 14% and 20% respectively. These effects are found to be more pronounced - 16% and 31% respectively - if evidence were drawn exclusively from ethnically mixed municipalities, in which each of the two main ethnic groups is represented by a separate set of political parties.

In Chapter 3, I presented evidence that households contribute more to local public goods in the presence of a community organization based on cross-sectional survey data from low-income neighbourhoods of Quito, Ecuador. The observed differences in household contributions were attributed to the ability of a community organization to coercively induce households to commit their time to community projects. This coercive power is argued
to have origins associated with the formation of a neighbourhood as an illegal settlement. This coercive power was also suggested to have been a by-product of households voluntarily contributing to the organization in return for protection against government eviction. Locations with specific geographic characteristics were discovered to have served an important role in providing natural protection and also in legally qualifying the organization to seek a global title over the invaded land. Using exogenous variation in these geographic characteristics, I found that the presence of a community organization has a positive effect on household time contributions to two public goods: trash collection in public areas (50 %) and community patrolling (176 %).

In Chapter 4, I developed an occupational choice model with open-rule legislative bargaining to determine the conditions allowing for poor property rights to arise in a democratic equilibrium and to also demonstrate that their presence leads to inefficient outcomes. The necessary conditions emerge when each rich agent self-selects as an entrepreneur for a positive theft rate. The equilibrium occupational shares determine the necessity for coalition formation in the legislature, where the endogenously determined status-quo theft rate is subject to revision. A minimum winning coalition favouring a higher theft rate up to a threshold value, at which each rich agent is just willing to be an entrepreneur who hires workers, provide the sufficient conditions. The equilibrium was found to be inefficient because a positive equilibrium theft rate reduces implies that not all of endowment is invested in the most productive process. The majority in this society, the ex-ante identical poor agents, also end up being ex-post identical but their most preferred theft rate is higher relative to the equilibrium theft rate. This result arose because the poor agents end up being represented by two political parties, neither of which has the majority in the legislature. I used a motivating example of a politically-organized land invasion to argue the model’s assumptions are plausible and to also motivate why an outcome of partial stealing and no evictions emerges in equilibrium.

The findings of this Thesis are strongly suggestive that the formation of one set of political institutions over another has an economically meaningful effect on public good provision - a main pillar of the modern welfare state. In addition, the results of this Thesis suggest that redistributive policies, a second pillar of the modern welfare state, may be pursued at the expense of undermining property rights protection if initial inequality is too high.
Appendix A

Largest Remainder Methods

The largest remainder methods, as noted in Section 2, use a quota as the main principle for the allocation of seats across political parties. The simplest quota is derived by dividing the vote share 100 by the size of the legislature $N$ as shown Equation A.1.

$$Q = \frac{100}{N}. \quad (A.1)$$

In most general terms, the class of largest remainder methods, illustrated in Table C.1 in Section 2, differ with respect to the inclusion of two integer parameters $k_1$ and $k_2$ in computing the quota as shown in Equation A.2.

$$Q = \frac{100}{N+k_1} + k_2, \quad (A.2)$$

The Hare method uses the quota Equation A.1. The other largest remainder methods, Hagenbach-Bischoff, the Imperiali and the Reinforced Imperiali use, as illustrated in Table C.1, $k_1 = 1$, $k_1 = 2$, and $k_1 = 3$ respectively; for all three methods $k_2 = 0$. The Droop method uses $k_1 = 1$ and $k_2 = 1$.

To allocate seats across political parties, each largest remainder method computes the corresponding quota. Then, the vote share of each political party, $v_p$, of party $\alpha_p \forall p$ is divided by $Q$.

$$m_p = \frac{v_p}{Q} \forall p \quad (A.3)$$

For the methodological exposition of this argument, the resulting number $m_p$ can be separated into two components - an integer $b_p \in \{0, 1, ..., 100\}$ and a remainder $c_p \in [0, 1]$
such that $m_p = b_p + c_p$. A largest remainder method allocates $b_p$ number of seats regardless of the distribution of the popular vote $\Omega$. If there are unallocated seats, that is $\sum b_p < N$, the remaining seats $N - \sum b_p$ are allocated to those political parties with the largest remainders $c_p$. That is, the highest ranked $N - \sum b_p$ remainders $c_p$ are awarded a seat each.

The assignment variable for the largest remainder methods would measure the number of quotas that the largest political party has to gain/lose to earn the pivotal seat in the legislature. Formally,

**Definition 2** For a given seat allocation $(w, N - w; N, \Omega, \nu)$, an assignment variable $X$ measures the minimum transfer in vote share to the largest political party $\alpha_1$ necessary to generate the seat allocation $(\frac{N+1}{2}, \frac{N-1}{2}; N, \hat{\Omega}, \nu)$ such that the following two conditions are being met:

- a transfer of quotas $Q$ of size $w - \frac{N+1}{2} - 1$ from an arbitrary political party(ies).
- there is a transfer of remainders: $c_1 - \tilde{c}_1$ if $c_1 > \tilde{c}_1$ from a political party drawn from $\alpha_1$ and denoted by $\bar{\alpha}_1$. $\bar{c}_1$ is the remainder of $\alpha_1$ and also the lowest remainder that grants any political party a seat.

**Proposition 4** An assignment variable $X$ measures the minimum transfer in vote share necessary to generate the seat allocation $(\frac{N+1}{2}, \frac{N-1}{2}; N, \hat{\Omega}, \nu)$, i.e.

$$X = (\frac{N+1}{2} - w - 1)Q + (\bar{c}_1 - c_1)Q \quad (A.4)$$

**Proof:**

Each political party $\alpha_p$ may be allocated at most one seat in the competition of largest remainders. All remaining seats it may be allocated are of size $Q$.

For a transfer to be minimum, $\alpha_1$ must earn one seat from the competition of largest remainders. This is because such seat can be earned by a vote share $c_1Q \leq Q$ since $c_1 \in [0, 1]$.

There are two cases that need to be considered:

Case 1: $c_1 > \bar{c}_1$, i.e. $\alpha_1$ receives one seat from the competition of largest remainders but $c_1$ is not the lowest largest remainder that grants any political party a seat. A negative transfer of size $(c_1 - \bar{c}_1)Q$ bring $\alpha_1$ to the threshold of earning a seat from the competition of largest remainders.

Case 2: $c_1 \leq \bar{c}_1$, i.e. $\alpha_1$ does not receive one seat from the competition of largest remainders. A positive transfer of size $(c_1 - \bar{c}_1)Q$ bring $\alpha_1$. 


All other seats have equal value of size $Q$. $\alpha_1$ requires $\frac{N+1}{2} - w - 1$ of these seats in order to obtain a seat share $\frac{N+1}{2}$. As these seats have equal vote share equal to $Q$, it is indeterminate from which political party(ies) these quotas are transfers to $\alpha_1$.

QED.
Appendix B

Lowest Vote Share

The d'Hondt method implies that the score with rank \( r = N \) in a legislature of size \( N \) is the lowest that grants any political party a seat. It is of interest to find what is the lowest vote share that would grant a political party political representation in the legislature, i.e. at least one seat, for any distribution of vote shares \( \Omega \).

**Proposition 5.** The lowest vote share of a political party \( p \) that grants it at least one parliamentary seat for any distribution of vote shares \( \Omega \) is given by:

\[
  v_p = \max\{\frac{100}{N}, \chi\},
\]

where \( \chi \) is the minimum legal threshold requirement for representation.

**Proof:**

Consider the case \( \frac{100}{N} > \chi \).

First, I show that a distribution of vote shares \( \bar{\Omega} \), in which the lowest-ranked score of each political party granting it a seat equals \( \frac{100}{N} \), generates the highest effective requirement for representation among all distributions \( \Omega \). Because the d’Hondt method uses a sequence of divisors \( \{1, 2, \ldots, N\} \), the vote shares of \( \bar{\Omega} \) must equal \( \frac{100}{N} \) or strictly positive integer multiples of it. For \( \bar{\Omega} \), any score \( \geq \frac{100}{N} \) receives a rank \( r \leq N \).

The restrictions imposed on \( \bar{\Omega} \) do not prevent it from encompassing an exhaustive set of seat distributions. This is for the following reason. Let \( n_p \in \{1, \ldots, N\} \) be the corresponding divisors of the lowest-ranked scores granting each party \( \alpha_p \) a seat. Since the d’Hondt method uses a sequence \( \{1, 2, \ldots, N\} \), the each \( n_p \) also denotes the number of seats earned by each \( \alpha_p \). This implies that, \( \sum_p n_p = N \). In addition, since by assumption each score corresponding to \( n_p \) equals \( \frac{100}{N} \), then \( \sum_p v_p = \sum_p n_p \frac{100}{N} = 100 \).
Next I show that there does not exist a distribution, for which a score $> \frac{100}{N}$ receives a rank $r > N$. Suppose not. There is at least one political party $\alpha_p$ that does not elect a seat with a score $= \frac{100}{N} + \epsilon$, where $\epsilon > 0$ is small enough not to induce a change in the seat distribution. Using the relationship between scores and vote share of each political party, $v_p = n_p(\frac{100}{N} + \epsilon)$, where $n_p$ is the divisor of this score associated with political party $\alpha_p$. In turn, this implies that there is at least one other political party $\alpha_{p'}$ whose vote share $v_{p'}$ must have decreased in response to increasing the vote share of $\alpha_p$ by $n_p\epsilon$. That is, $v_{p'}$ is not an integer multiple of $\frac{100}{N}$, in turn implying that none of the scores of $\alpha_{p'}$ are integer multiples of $\frac{100}{N}$ due to the sequence of divisors used in the d’Hondt method. Given that the seat distribution is unchanged and $v_{p'}$ has decreased, the lowest-ranked score that grants $\alpha_{p'}$ a seat must now be lower than $\frac{100}{N}$. This implies that any score $> \frac{100}{N}$ receives a rank $r \leq N$. This achieves the desired contradiction for $\epsilon > 0$. The proof for $\epsilon < 0$ is analogous.

Consider the case $\frac{100}{N} \leq v$.

It immediately follows that a political party must meet the minimum legal requirement $v$. This is because a political obtaining a vote share at least as high as $\frac{100}{N}$ would have earned at least a seat in the absence of $v$.

QED.

In the main body of this paper, the number $\frac{100}{N}$ is being referred to as the value of a full seat.
Appendix C

Chapter 2: Figures and Tables
Figure C.1: **Baseline Results: Densities (Pre-election Years)**

(a) Share of Capital Outlays to Total Expenditure - Annual $\%\Delta$ Change (Full Sample)

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote ($\%$). Scatter dots represent the relationship between the mean annual change in the share of capital outlays (tangible investment) and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
Figure C.2: Baseline Results: Densities (Pre-election Years)

(a) Share of Tangible Investment to Total Expenditure - Annual $%\Delta$ Change (Full Sample)

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in the share of capital outlays (tangible investment) and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
Figure C.3: Baseline Results: Densities (Pre-election Years)

(a) Share of Capital Outlays to Total Expenditure - Annual $\%\Delta$ Change (Sample of Ethnically-mixed Municipalities)

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in the share of capital outlays (tangible investment) and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
Figure C.4: **Baseline Results: Densities (Pre-election Years)**

(a) Share of Tangible Investment to Total Expenditure - Annual \( \% \Delta \) Change (Sample of Ethnically-mixed Municipalities)

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in the share of capital outlays (tangible investment) and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in either (a) total expenditure, (b) capital outlays, or (c) tangible investment and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
Figure C.6: **Baseline Results: Densities (Pre-election Years)**

(a) Capital Outlays

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in either (a) total expenditure, (b) capital outlays, or (c) tangible investment and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
Figure C.7: **Baseline Results: Densities (Pre-election Years)**

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in either (a) total expenditure, (b) capital outlays, or (c) tangible investment and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
Figure C.8: **Baseline Results: Densities (4-year Electoral Cycle)**

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in the share of capital outlays (tangible investment) and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the threshold of the assignment variable.
Figure C.9: **Sensitivity Analysis: Sources of Government Revenue (Pre-election Years)**

(a) **Revenue from Direct Taxes - Annual %△ (Full Sample)**

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in either (a) revenue from direct taxes, (b) revenue from indirect taxes, or (c) capital transfer from upper-level governments and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the eligibility threshold.
Figure C.10: Sensitivity Analysis: Sources of Government Revenue (Pre-election Years)

(a) Revenue from Indirect Taxes - Annual %△ (Full Sample)

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in either (a) revenue from direct taxes, (b) revenue from indirect taxes, or (c) capital transfer from upper-level governments and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the eligibility threshold.
Figure C.11: **Sensitivity Analysis: Sources of Government Revenue (Pre-election Years)**

(a) Capital Transfers from Upper-level Governments - Annual $\% \Delta$ (Full Sample)

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote ($\%$). Scatter dots represent the relationship between the mean annual change in either (a) revenue from direct taxes, (b) revenue from indirect taxes, or (c) capital transfer from upper-level governments and the midpoint of each bin of size 0.2 $\%$. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the eligibility threshold.
Figure C.12: Sensitivity Analysis: Council Size and Fiscal Capacity

(a) Council Size

The figure presents the probability density of a municipality’s margin from experiencing a switch in the form of government, measured as the minimum transfer of the popular vote (%). Scatter dots represent the relationship between the mean annual change in either (a) municipal council size, or (b) GDP and the midpoint of each bin of size 0.2 %. Solid green lines are nonparametric fits from a local linear regression that uses triangular kernels with a bandwidth of 2 percentage points, separately estimated on both sides of the eligibility threshold.

(b) GDP per capita (The Basque Country Average = 100) (Full Sample)
Table C.1: **Highest Average (HA) and Largest Remainder (LR) Methods: Summary**

<table>
<thead>
<tr>
<th>HA Method</th>
<th>$n^{th}$ divisor</th>
<th>Sequence (first 5 divisors)</th>
<th>LR Method</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>d’Hondt</td>
<td>$n$</td>
<td>1, 2, 3, 4, 5</td>
<td>Hare</td>
<td>$\frac{v}{N}$</td>
</tr>
<tr>
<td>St. Lague</td>
<td>$2n - 1$</td>
<td>1, 3, 5, 7, 9</td>
<td>Hagenbach-Bischoff</td>
<td>$\frac{v}{N+1}$</td>
</tr>
<tr>
<td>Modified</td>
<td>$2n - 1$</td>
<td>1.4, 3, 5, 7, 9</td>
<td>Droop</td>
<td>$\frac{v}{N+1} + 1$</td>
</tr>
<tr>
<td>St. Lague$^1$</td>
<td>$2n - 1$</td>
<td>1.5, 3, 5, 7, 9</td>
<td>Imperiali</td>
<td>$\frac{v}{N+2}$</td>
</tr>
<tr>
<td>Hungarian</td>
<td>$2n - 1$</td>
<td>1.5, 3, 5, 7, 9</td>
<td>Reinforced Imperiali</td>
<td>$\frac{v}{N+3}$</td>
</tr>
<tr>
<td>Danish method</td>
<td>$3n - 2$</td>
<td>1, 4, 7, 10, 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imperiali divisors</td>
<td>$\frac{n}{2} - \frac{1}{2}$</td>
<td>$\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \frac{9}{2}$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1. The first term in the sequence does not comply with the formula for the $n^{th}$ divisor. 2. $v$ is the vote share of each political party and $N$ is the legislature size.
### Table C.2: d'Hondt Method: Allocation of Vote Shares into Parliamentary Seats

<table>
<thead>
<tr>
<th>Party name</th>
<th>Vote share</th>
<th>Score ( n = 1 )</th>
<th>Score ( n = 2 )</th>
<th>Score ( n = 3 )</th>
<th>Score ( n = 4 )</th>
<th>Score ( n = 5 )</th>
<th>Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>42 %</td>
<td>42</td>
<td>21</td>
<td>14</td>
<td>10.5</td>
<td>8.4</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>32 %</td>
<td>32</td>
<td>16</td>
<td>10.67</td>
<td>8</td>
<td>6.6</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>15 %</td>
<td>15</td>
<td>7.5</td>
<td>5</td>
<td>3.75</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>11 %</td>
<td>11</td>
<td>5.5</td>
<td>3.67</td>
<td>2.75</td>
<td>2.2</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes: 1. \( n \) is the divisor used to derive each score from the corresponding vote share of each political party. 2. The scores in blue (red) colour in the upper table win (do not win) seats for their respective parties. The respective ranks of these scores are given in lower table with the corresponding colour. 3. The five highest-ranked scores earn seats for their respectively political party reflecting that the legislature is of size \( N = 5 \). 4. The number of scores with rank \( r \leq 5 \) are then counted horizontally for each political party, thus arriving at the seat-allocation in the rightmost column. 5. There is a hung parliament as no single political party commands the majority of the parliamentary seats necessitating the formation of a coalition government.

### Table C.3: d'Hondt Method: Allocation of Vote Shares into Parliamentary Seats in the Presence of an Electoral Threshold

<table>
<thead>
<tr>
<th>Party name</th>
<th>Vote share</th>
<th>Score ( n = 1 )</th>
<th>Score ( n = 2 )</th>
<th>Score ( n = 3 )</th>
<th>Score ( n = 4 )</th>
<th>Score ( n = 5 )</th>
<th>Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>42%</td>
<td>42</td>
<td>21</td>
<td>14</td>
<td>10.5</td>
<td>8.4</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>32%</td>
<td>32</td>
<td>16</td>
<td>10.67</td>
<td>8</td>
<td>6.6</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>15%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>11%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes: 1. \( n \) is the divisor used to derive each score from the corresponding vote share of each political party. 2. In this example, there is an electoral threshold equal to 20 %. Party C and Party D do not meet this electoral threshold and are therefore ineligible for parliamentary seats. The d'Hondt method does not assign scores to Party C or Party D in order to make them ineligible for seats. 3. The scores in blue (red) colour win (do not win) seats for their respective parties. 4. There is a majority parliament allowing for the formation of a single party government as Party A commands the majority of the parliamentary seats.
### Table C.4: The Construction of the Assignment Variable

<table>
<thead>
<tr>
<th>Party name</th>
<th>Vote share</th>
<th>Score $n=1$</th>
<th>Score $n=2$</th>
<th>Score $n=3$</th>
<th>Score $n=4$</th>
<th>Score $n=5$</th>
<th>Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>42 %</td>
<td>42 + $X%$</td>
<td>21 + $\frac{X}{3}$</td>
<td>14 + $\frac{X}{3}$</td>
<td>10.5 + $\frac{X}{3}$</td>
<td>8.4 + $\frac{X}{3}$</td>
<td>2 + 1 = 3</td>
</tr>
<tr>
<td>B</td>
<td>32 %</td>
<td>32</td>
<td>16</td>
<td>10.67</td>
<td>8</td>
<td>6.6</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>15 %</td>
<td>15 - $X%$</td>
<td>7.5 - $\frac{X}{3}$</td>
<td>5 - $\frac{X}{3}$</td>
<td>3.75 - $\frac{X}{3}$</td>
<td>3 - $\frac{X}{3}$</td>
<td>1 - 1 = 0</td>
</tr>
<tr>
<td>D</td>
<td>11 %</td>
<td>11</td>
<td>5.5</td>
<td>3.67</td>
<td>2.75</td>
<td>2.2</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes: 1. $n$ is the divisor used to derive each score from the corresponding vote share of each political party. 2. The scores in blue (red) colour in the upper table win (do not win) seats for their respective parties prior to the implementation of the transfer $X$. 3. The cells in yellow background are associated with rank $r_A(14 + \frac{X}{3}) = \frac{N+1}{2} = 3$ and $r_A(15 - X) = \frac{N+1}{2} = 3$ within the subset of scores of Party A and all political parties other than Party A respectively, where $N = 5$ is the legislature size. 4. $X$ is the minimum transfer of vote shares that brings Party A to the tipping point of losing the pivotal $\frac{N+1}{2}$, i.e. third, seat. $X$ is the solution to the equation $14 + \frac{X}{3} = 15 - X$. In this example, $X = 0.75\%$, a positive value that corresponds to a hung parliament necessitating the formation of a coalition government as specified in Section 3. In a hung parliament, no single party commands the majority of the parliamentary seats.

### Table C.5: Legislature Size Reduction Results in a Switch in the Form of Government

<table>
<thead>
<tr>
<th>Party name</th>
<th>Vote share</th>
<th>Score $n=1$</th>
<th>Score $n=2$</th>
<th>Score $n=3$</th>
<th>Score $n=4$</th>
<th>Score $n=5$</th>
<th>Seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>42 %</td>
<td>42</td>
<td>21</td>
<td>14</td>
<td>10.5</td>
<td>8.4</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>32 %</td>
<td>32</td>
<td>16</td>
<td>10.67</td>
<td>8</td>
<td>6.6</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>15 %</td>
<td>15</td>
<td>7.5</td>
<td>5</td>
<td>3.75</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>11 %</td>
<td>11</td>
<td>5.5</td>
<td>3.67</td>
<td>2.75</td>
<td>2.2</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes: 1. $n$ is the divisor used to derive each score from the corresponding vote share of each political party. 2. The scores in blue colour in the top panel are the five highest-ranked corresponding to a legislature of size $N = 5$. The scores in blue colour in the bottom panel are the three highest-ranked scores corresponding to a legislature of size $N' = 3$. The remaining scores, in red colour, in each panel do not earn seats for their respective political parties. 3. In the top panel, there is a hung parliament necessitating the formation of a coalition government as no political party commands the majority of the parliamentary seats. In the bottom panel, there is a majority parliament allowing Party A to form a single party government as it commands the majority of the parliamentary seats.
Figure C.13: Sensitivity Analysis: McCrary Test

(a) McCrary Test: ±2% Margin

(b) McCrary Test: ±5% Margin

The McCrary test checks for manipulation of the assignment variable by estimating whether there is a break in the density at the threshold of the assignment variable. Panels (a) and (b) use a window of ±2% and ±5% respectively from the threshold of the assignment variable. In either instance, the McCrary does not test to detect a discontinuity in the density at the threshold of the assignment variable. This result provides empirical support for the absence of precise manipulation at the threshold of the assignment variable.
Table C.6: Electoral Cycles in the Basque Country

<table>
<thead>
<tr>
<th>Elec. Cycle</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3 (Pre-election Year)</th>
<th>Year 4 (Election Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elec. Cycle 4</td>
<td>2008</td>
<td>2009</td>
<td>2010</td>
<td>2011¹</td>
</tr>
</tbody>
</table>

Notes: ¹ Data on municipal government expenditure and revenue as well as their components is only available 1997 - 2010.
Table C.7: **Descriptive Statistics: Government Expenditure**

<table>
<thead>
<tr>
<th>Annual %Δ over One Fiscal Year (Year 3 relative to Year 2 of Electoral Cycle)</th>
<th>Coalition Governments</th>
<th>Single Party Governments</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>%Δ Expenditure (per capita)</td>
<td>6.61</td>
<td>21.82</td>
<td>-15.22*</td>
</tr>
<tr>
<td>%Δ Capital Outlays (per capita)</td>
<td>42.17</td>
<td>105.84</td>
<td>-63.67**</td>
</tr>
<tr>
<td>%Δ Tangible Investment (per capita)</td>
<td>43.25</td>
<td>98.49</td>
<td>-55.24**</td>
</tr>
<tr>
<td>%Δ share of Capital Outlays to Expenditure</td>
<td>-2.30</td>
<td>2.76</td>
<td>-5.06**</td>
</tr>
<tr>
<td>%Δ share of Tangible Investment to Expenditure</td>
<td>-3.27</td>
<td>3.13</td>
<td>-6.40**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual %Δ over a 4-year Electoral Cycle</th>
<th>Coalition Governments</th>
<th>Single Party Governments</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>%Δ Expenditure (per capita)</td>
<td>12.83</td>
<td>30.36</td>
<td>-17.54**</td>
</tr>
</tbody>
</table>

Notes: 1. *** denotes significance at the 1 % level, ** denotes significances at the 5 % level and * denotes significance at the 10 % level. The included observations have a population size between 100 and 5,000 residents and lie within ±2% from the threshold of the assignment variable X. 2. The reported descriptive statistics in the top panel (pre-election years) are based on data drawn from all 4 electoral cycles, while in the bottom panel (4-year electoral cycle) they are reported based on data drawn from the 2 electoral cycles for which data is available.

Table C.8: **Descriptive Statistics: Municipal Council Size and Relative Frequency of Form of Government**

<table>
<thead>
<tr>
<th>Number of Observations</th>
<th>Municipal Council Size</th>
<th>Value of a Full Seat</th>
<th>Coalition Governments (Percentage of Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>73</td>
<td>5</td>
<td>20.00 %</td>
<td>4.20 %</td>
</tr>
<tr>
<td>297</td>
<td>7</td>
<td>14.29 %</td>
<td>10.80 %</td>
</tr>
<tr>
<td>153</td>
<td>9</td>
<td>11.11 %</td>
<td>30.70 %</td>
</tr>
<tr>
<td>123</td>
<td>11</td>
<td>9.09 %</td>
<td>40.60 %</td>
</tr>
<tr>
<td>89</td>
<td>13</td>
<td>7.69 %</td>
<td>52.70 %</td>
</tr>
<tr>
<td>82</td>
<td>17</td>
<td>5.88 %</td>
<td>62.20 %</td>
</tr>
<tr>
<td>37</td>
<td>21</td>
<td>4.76 %</td>
<td>78.40 %</td>
</tr>
<tr>
<td>12</td>
<td>25</td>
<td>4.00 %</td>
<td>100.00 %</td>
</tr>
<tr>
<td>9</td>
<td>27</td>
<td>3.70 %</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>

Notes: The value of a full seat represents the vote share that guarantees any political party municipal council representation under the d’Hondt method regardless of the overall vote share distribution.
Table C.9: Baseline Results: Pre-election Years (Full Sample)

<table>
<thead>
<tr>
<th></th>
<th>%Δ Total Spending</th>
<th>%Δ Cap Outlays</th>
<th>%Δ Tang Inv</th>
<th>%Δ Share of Cap Outlays³</th>
<th>%Δ Share of Tang Inv³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>-20.84*</td>
<td>-57.94*</td>
<td>-87.37**</td>
<td>-14.22***</td>
<td>-19.57***</td>
</tr>
<tr>
<td>Gov</td>
<td>(12.14)</td>
<td>(40.61)</td>
<td>(36.45)</td>
<td>(4.36)</td>
<td>(5.44)</td>
</tr>
<tr>
<td># of Obs.</td>
<td>145</td>
<td>145</td>
<td>145</td>
<td>145</td>
<td>145</td>
</tr>
</tbody>
</table>

Notes: 1. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10. Standard errors are reported in parentheses. 2. The included observations lie within ±2% of the threshold of the assignment variable. 3. Each component - capital outlays or tangible investment - is measured as a share of total expenditure.

Table C.10: Baseline Results: Pre-election Years (Ethnically Mixed Municipalities Only)

<table>
<thead>
<tr>
<th></th>
<th>%Δ Total Spending</th>
<th>%Δ Cap Outlays</th>
<th>%Δ Tang Inv</th>
<th>%Δ Share of Cap Outlays³</th>
<th>%Δ Share of Tang Inv³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>-25.34*</td>
<td>-136.32*</td>
<td>-175.55**</td>
<td>-17.56*</td>
<td>-32.61***</td>
</tr>
<tr>
<td>Gov</td>
<td>(15.40)</td>
<td>(62.89)</td>
<td>(92.96)</td>
<td>(10.35)</td>
<td>(10.95)</td>
</tr>
<tr>
<td># of Obs.</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
</tbody>
</table>

Notes: 1. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10. Standard errors are reported in parentheses. 2. The included observations lie within ±2% of the threshold of the assignment variable. 3. Each component - capital outlays or tangible investment - is measured as a share of total expenditure.
Table C.11: **Sensitivity Analysis: Varying the Window of the Assignment Variable**

<table>
<thead>
<tr>
<th>Margin</th>
<th>%△ Total Spending</th>
<th>%△ Cap Outlays</th>
<th>%△ Tang Inv</th>
<th>%△ Share of Cap Outlays³</th>
<th>%△ Share of Tang Inv³</th>
</tr>
</thead>
<tbody>
<tr>
<td>± 5 %</td>
<td>-30.13***</td>
<td>-83.03***</td>
<td>-93.52***</td>
<td>-13.65***</td>
<td>-13.65***</td>
</tr>
<tr>
<td></td>
<td>(10.12)</td>
<td>(18.84)</td>
<td>(27.36)</td>
<td>(3.03)</td>
<td>(3.03)</td>
</tr>
<tr>
<td>± 4 %</td>
<td>-29.92***</td>
<td>-84.10***</td>
<td>-90.81***</td>
<td>-12.05***</td>
<td>-13.97***</td>
</tr>
<tr>
<td></td>
<td>(10.70)</td>
<td>(15.13)</td>
<td>(34.90)</td>
<td>(2.42)</td>
<td>(2.87)</td>
</tr>
<tr>
<td>± 3 %</td>
<td>-26.27***</td>
<td>-78.26***</td>
<td>-96.13***</td>
<td>-12.49***</td>
<td>-14.78***</td>
</tr>
<tr>
<td></td>
<td>(10.60)</td>
<td>(15.70)</td>
<td>(28.76)</td>
<td>(1.61)</td>
<td>(2.89)</td>
</tr>
<tr>
<td>± 2 %</td>
<td>-20.84*</td>
<td>-57.94*</td>
<td>-87.37**</td>
<td>-14.22***</td>
<td>-19.57***</td>
</tr>
<tr>
<td></td>
<td>(12.14)</td>
<td>(40.61)</td>
<td>(36.45)</td>
<td>(4.36)</td>
<td>(5.44)</td>
</tr>
<tr>
<td>± 1 %</td>
<td>-13.49*</td>
<td>-44.12**</td>
<td>-94.22**</td>
<td>-14.51***</td>
<td>-22.86***</td>
</tr>
<tr>
<td></td>
<td>(7.92)</td>
<td>(25.98)</td>
<td>(39.99)</td>
<td>(4.14)</td>
<td>(3.97)</td>
</tr>
</tbody>
</table>

Notes: 1. Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are reported in parentheses. 2. Each component - capital outlays or tangible investment - is measured as a share of total expenditure. 3. ‘Margin’ stands for the margin from the threshold of the assignment variable. The reported estimates are based on a sample that is made up of the observations within the specified margin in each row. 4. Each coefficient in the table measures the effect of a coalition government relative to a single party government on government expenditure variables in the top row.
Table C.12: Sensitivity Analysis: Varying the Number of Electoral Cycles

<table>
<thead>
<tr>
<th>Sample Restriction</th>
<th>%△ Share of Capital Outlays(^2)</th>
<th>%△ Share of Tangible Investment(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Electoral Cycles</td>
<td>-16.60</td>
<td>-24.09**</td>
</tr>
<tr>
<td>Except 1995-1999</td>
<td>(11.43)</td>
<td>(12.48)</td>
</tr>
<tr>
<td>All Electoral Cycles</td>
<td>-14.82</td>
<td>-21.16**</td>
</tr>
<tr>
<td>Except 1999-2003</td>
<td>(11.16)</td>
<td>(10.44)</td>
</tr>
<tr>
<td>All Electoral Cycles</td>
<td>-18.37</td>
<td>-29.57***</td>
</tr>
<tr>
<td>Except 2003-2007</td>
<td>(11.81)</td>
<td>(10.27)</td>
</tr>
<tr>
<td>All Electoral Cycles</td>
<td>-14.53</td>
<td>-25.30***</td>
</tr>
<tr>
<td>Except 2007-2011</td>
<td>(11.41)</td>
<td>(10.22)</td>
</tr>
<tr>
<td># of Observations</td>
<td>145</td>
<td>145</td>
</tr>
<tr>
<td>Sample</td>
<td>All Ethnically-mixed</td>
<td>All Ethnically-mixed</td>
</tr>
</tbody>
</table>

Notes: 1. Levels of significance: \(** p < 0.01, ** p < 0.05, * p < 0.10\). Standard errors are reported in parentheses. 2. Each component - capital outlays or tangible investment - is measured as a share of total expenditure. 3. To rule out the possibility that the observations from a single electoral cycle are driving the results, all observations corresponding to a single electoral cycle are excluded one at a time. 4. Each coefficient in the table measures the effect of a coalition government relative to a single party government on the shares of government expenditure. 5. The included observation lie within ±2% from the threshold of the assignment variable.
Table C.13: Sensitivity Analysis: Varying the Size of Municipal Council

<table>
<thead>
<tr>
<th>Sample Restriction</th>
<th>%Δ Share of Capital Outlays&lt;sup&gt;2&lt;/sup&gt;</th>
<th>%Δ Share of Tangible Investment&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Except Council Size = 5</td>
<td>-16.82*** -25.71**</td>
<td>-26.87*** -33.34***</td>
</tr>
<tr>
<td></td>
<td>(7.20) (12.00)</td>
<td>(10.27) (11.06)</td>
</tr>
<tr>
<td>All Except Council Size = 7</td>
<td>-32.72*** -41.71**</td>
<td>-33.17*** -33.96***</td>
</tr>
<tr>
<td></td>
<td>(11.88) 18.33</td>
<td>(10.90) (13.23)</td>
</tr>
<tr>
<td>All Except Council Size = 9</td>
<td>-9.83* -18.57</td>
<td>-22.53* -43.28***</td>
</tr>
<tr>
<td></td>
<td>(5.21) (12.03)</td>
<td>(12.73) (16.46)</td>
</tr>
<tr>
<td>All Except Council Size = 11</td>
<td>-5.95 -14.64*</td>
<td>-20.29** -22.57***</td>
</tr>
<tr>
<td></td>
<td>(9.35) (8.33)</td>
<td>(11.08) (7.02)</td>
</tr>
<tr>
<td>All Except Council Size = 13</td>
<td>-15.38*** -21.87**</td>
<td>-25.29*** -34.58***</td>
</tr>
<tr>
<td></td>
<td>(4.64) (10.27)</td>
<td>(9.82) (11.89)</td>
</tr>
<tr>
<td># of Observations</td>
<td>145 72</td>
<td>145 72</td>
</tr>
</tbody>
</table>

Sample | All | Ethnically-mixed | All | Ethnically-mixed

Notes: 1. Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10. Standard errors are reported in parentheses. 2. Each component - capital outlays or tangible investment - is measured as a share of total expenditure. 3. To rule out the possibility that the observations from a specific council size are driving the baseline results, all observations corresponding to a single council size are excluded one at a time. 4. Each coefficient reported in the table measures the effect of a coalition government relative to a single party government on the shares of government expenditure. 5. The included observations lie within ±2% from the threshold of the assignment variable.
Table C.14: **Sensitivity Analysis: Number of Observations in Proximity to the Threshold of the Assignment Variable**

<table>
<thead>
<tr>
<th>Minimum Transfer of the Popular Vote(^1) (%)</th>
<th>Coalition Governments</th>
<th>Single Party Governments</th>
<th>All Governments</th>
</tr>
</thead>
<tbody>
<tr>
<td>±1%</td>
<td>48</td>
<td>34</td>
<td>82</td>
</tr>
<tr>
<td>±2%</td>
<td>73</td>
<td>72</td>
<td>145</td>
</tr>
<tr>
<td>±3%</td>
<td>97</td>
<td>99</td>
<td>196</td>
</tr>
<tr>
<td>±4%</td>
<td>108</td>
<td>131</td>
<td>239</td>
</tr>
<tr>
<td>±5%</td>
<td>119</td>
<td>168</td>
<td>287</td>
</tr>
</tbody>
</table>

Notes: 1. The minimum transfer of the popular vote (%) is the assignment variable used in the empirical analysis. The indicated margin indicates how many observations lie on either side of the assignment variable. Since the assignment variable achieves perfect compliance with respect to the treatment status, i.e. form of government, all positive values are associated with coalition governments and and all non-positive values are associated with single-party governments.
Table C.15: **Sensitivity Analysis: Inclusion of Covariates**

<table>
<thead>
<tr>
<th></th>
<th>%△ Share of Tangible Investnment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(5.44) (5.09) (4.83) (4.91) (7.23) (6.81) (6.65)</td>
</tr>
<tr>
<td>Gov</td>
<td>-0.33 -0.11 -0.33 0.59 0.65 0.65</td>
</tr>
<tr>
<td></td>
<td>(0.05) (0.13) (0.46) (0.29) (0.82) (0.86)</td>
</tr>
<tr>
<td>GDP</td>
<td>0.03 -0.11 -0.33 0.59 0.65 0.65</td>
</tr>
<tr>
<td></td>
<td>(0.05) (0.13) (0.46) (0.29) (0.82) (0.86)</td>
</tr>
<tr>
<td>Gov</td>
<td>-0.33 -0.11 -0.12 -0.14 -0.14</td>
</tr>
<tr>
<td>Rev</td>
<td>(0.47) (0.13) (0.21) (0.22) (0.28)</td>
</tr>
<tr>
<td>Seats</td>
<td>7.29 -9.31 -9.08 -9.10</td>
</tr>
<tr>
<td></td>
<td>(6.58) (12.60) (13.20) (12.90)</td>
</tr>
<tr>
<td>Share Ethn.</td>
<td>0.02 0.00 0.00</td>
</tr>
<tr>
<td></td>
<td>(0.02) (0.01) (0.01)</td>
</tr>
<tr>
<td>Basq. Ethn.</td>
<td>0.18 0.29</td>
</tr>
<tr>
<td></td>
<td>(0.30) (0.22)</td>
</tr>
<tr>
<td>Frac. Party Exits</td>
<td>-0.40</td>
</tr>
<tr>
<td></td>
<td>(0.45)</td>
</tr>
<tr>
<td># of Obs.</td>
<td>145 145 145 145 145 145 145</td>
</tr>
</tbody>
</table>

Notes: 1. Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are reported in parentheses. 2. Tangible investment is measured as a share of total expenditure. 3. The included observation lie within ±2% from the threshold of the assignment variable.
Table C.16: **Sensitivity Analysis: Inclusion of Covariates from Preceding Electoral Cycle**

<table>
<thead>
<tr>
<th></th>
<th>%△ Share of Tangible Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coalition</strong></td>
<td>△ -19.57***</td>
</tr>
<tr>
<td><strong>Government</strong></td>
<td></td>
</tr>
<tr>
<td>Lag(Tangible Investment)</td>
<td>-0.03</td>
</tr>
<tr>
<td>Lag(Capital Outlays)</td>
<td>0.20</td>
</tr>
<tr>
<td>Lag(Direct Taxes)</td>
<td>-0.06</td>
</tr>
<tr>
<td>Lag(Indirect Taxes)</td>
<td>0.01</td>
</tr>
<tr>
<td>Lag(Capital Transfers from Fed/Reg Govt)</td>
<td>-0.07</td>
</tr>
<tr>
<td><strong># of Observations</strong></td>
<td>104</td>
</tr>
</tbody>
</table>

Notes: 1. Levels of significance: *** \( p < 0.01 \), ** \( p < 0.05 \), * \( p < 0.10 \). Standard errors are reported in parentheses. 2. Tangible investment is measured as a share of total expenditure. 3. The included observation lie within ±2% from the threshold of the assignment variable. 4. The data on the regressors are drawn from the first three electoral cycles (1995-1999, 1999-2003 and 2003-2007). The dependent variable includes observations from the last three electoral cycle (1999-2003, 2003-2007 and 2007-2011).
Table C.17: Simulations: The Impact of Municipal Council Size Reduction on the Effective Threshold Requirement for Representation

<table>
<thead>
<tr>
<th>Municipal Council Size</th>
<th># of Obs.</th>
<th>Effective Threshold$^2$ (for size = N)</th>
<th>Effective Threshold$^2$ (for size = N − 2)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>743</td>
<td>10.79 % (3.83)</td>
<td>15.06 % (5.88)</td>
<td>4.28*** %</td>
</tr>
<tr>
<td>$N = 5$</td>
<td>83</td>
<td>16.47 % (4.28)</td>
<td>26.99 % (5.53)</td>
<td>10.52*** %</td>
</tr>
<tr>
<td>$N = 7$</td>
<td>328</td>
<td>12.05 % (2.78)</td>
<td>16.87 % (2.19)</td>
<td>4.82*** %</td>
</tr>
<tr>
<td>$N = 9$</td>
<td>169</td>
<td>8.91 % (2.23)</td>
<td>11.79 % (1.21)</td>
<td>2.88*** %</td>
</tr>
<tr>
<td>$N = 11$</td>
<td>129</td>
<td>7.65 % (0.59)</td>
<td>9.03 % (0.69)</td>
<td>1.38*** %</td>
</tr>
<tr>
<td>$N = 13$</td>
<td>34</td>
<td>(5.96) % (1.93)</td>
<td>7.63 % (0.45)</td>
<td>1.67*** %</td>
</tr>
</tbody>
</table>

Notes: 1. Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are reported in parentheses. 2. The effective electoral threshold is measured as the vote share (%) that would qualify a political party for representation holding the distribution of vote shares fixed. 3. For this set of simulations, the effective electoral threshold measures the lowest-ranked score multiplied by a divisor $n = 1$. The lowest-ranked score that grants any political party a seat has a rank $r = N$ before the electoral reform and $r = N − 2$ after the electoral reform.
Appendix D

Applicability of Mechanism to Organized Labour

The mechanism described in this paper is arguably applicable to a wider range of grassroots organizations than the context of urban slums in Quito may suggest. In this section, I argue that this mechanism captures the key features that led to the emergence of organized labour in Britain during the XIX century.

Legal Challenges to Developing a Continuous Organization

Labour unions, for short unions, and any form of picketing were illegal in Britain until the 1870s. Earlier forms of unions faced considerable challenges not only in advancing the interests of their members to employers but also to the establishment of a continuous organization representing workers’ interests to their employer. Fraser (1999) suggests that what was required to create the shell of some continuous organization was the provision of mutual aid and in most cases workers’ lacked the legal tools to sustain mutual aid.

Some of the successful examples of early workers’ organizations in Britain formed around existing organizations, notably guilds of craftsmen, inherited from the period before the Industrial Revolution. One of the primary roles of these organizations was to provide mutual aid that included support for orphans and widows, cash payment for sick leave, etc. Historically, guilds also had an important function in controlling entry into the craft. The trend towards deregulation of the labour markets in Britain during the XIX century served as a motivating factor for these early organizations to also become occasionally involved in exerting pressure on employers in either preserving or improving working conditions.
Most of the low-skilled professions, however, lacked any form of existing organization that could be used to represent workers' interests. This was, in part, because the industries, in which workers of these professions were employed, were forming during the Industrial Revolution. The increasing deregulation of labour markets in the XIX century was associated with less stability in working conditions especially for low-skilled workers who would usually be employed in primarily competitive industries. (Fraser, 1999) In these industries, pay and employment were also likely to be more responsive to market conditions and thus more volatile. The volatility in pay and employment in turn served as an important trigger in the formation of early illegal local unions. Most of these organizations, however, lacked continuity. Workers flocked to them in times of industrial unrest and flocked out of them when the moment of confrontation had passed, thus leading to an early collapse of these unions. (Fraser, 1999)

Many local unions realized the necessity to receive some form of legitimacy even for their day-to-day operations. The Friendly Societies Act of 1855 provided local unions with an opportunity to register their organizations as friendly societies. This legal framework offered two main advantages to local unions. First, workers were subscribed for future benefits and failure to pay dues would result in loss of those benefits. Secondly, the worker's organization could store its monetary assets in financial organizations under the friendly society's name instead of that of an individual member. This was particularly important for local unions, which were commonly subjected to fraud. (Fraser, 1999)

**Cohesion among workers’ organizations**

The existence of a common threat that local workers’ organizations faced was the underlying incentive for their decision to relinquish some of their control in favour of a more centralized organization. According to Fraser (1999), local workers’ organizations ‘...had plenty of evidence from the struggles of the 1830s that employers were ready and capable of uniting to break [local] unions both through their own actions and in cahoots with allies in political authority...’ He emphasizes that direct confrontation led to the defeat and breakup of nascent unions. In response, local unions had recognized the need for an effective organization, where possible on a national basis, to offer protection within the industrial relations system. Nonetheless, giving up their independence and losing control over their funds was not an easy decision for local unions to make. (Fraser, 1999) In fact, Fraser (1999) points to a delicate trade-off that existed: ‘...there were always tensions over how far control and resources should be in the hands of a central executive and how far it should remain
with local unions and branches...’ In conclusion, it could be argued that only a sufficiently powerful common threat that was putting at risk the very existence of a large number of local unions was the trigger that persuaded them to relinquish some of their control and funds to a more centralized organization.

Accumulation of State Capacity

Central unions can be argued to have accumulated a considerable amount of state capacity, the necessary infrastructure in terms of administration, monitoring and enforcement, that has allowed them to sustain control over local unions even after unions and picketing were legalized in the 1870s. There were several factors that likely contributed to the accumulation of state capacity. The central organization, points Fraser (1999), was run by full-time administrative staff instead of blue-collar workers who volunteered their time to the local unions. This arguably led to better organization that likely to more effectively counter-balance some of the checks and balances that existed in the organization, e.g. a general meeting of delegates from the local unions who could overrule the executive of the central union. Other factors, outside of unions’ control, were also likely to have contributed to the accumulation of state capacity. Fraser (1999) suggests that the importance of improved communications by train and by telegraphy as well as great expansion of a cheaper press, all made nation-wide organizations easier to sustain.
Appendix E

Chapter 3: Figures and Tables
Table E.1: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Housing Coop: Yes</th>
<th>Housing Coop: No</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panel A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions to trash collection (per household member/month)</td>
<td>17.2 hrs.</td>
<td>10.7 hrs.</td>
<td>6.55***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.09)</td>
</tr>
<tr>
<td>Contributions to patrolling (per household member/year)</td>
<td>8.97 hrs</td>
<td>4.02 hrs.</td>
<td>4.95***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.87)</td>
</tr>
<tr>
<td>Panel B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncollected trash (by government)</td>
<td>13.3%</td>
<td>11.6 %</td>
<td>1.69***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.35)</td>
</tr>
<tr>
<td>Titled households</td>
<td>66 %</td>
<td>73 %</td>
<td>6.96***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.42)</td>
</tr>
<tr>
<td>Murders (per 1,000 residents)</td>
<td>4.93</td>
<td>4.21</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.53)</td>
</tr>
<tr>
<td>Income (monthly)</td>
<td>2,724</td>
<td>2,803</td>
<td>79.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(146.35)</td>
</tr>
<tr>
<td>Plot size (sq. meters)</td>
<td>138.4</td>
<td>215.4</td>
<td>77.00**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(27.95)</td>
</tr>
<tr>
<td>Plot size inequality (stdev)</td>
<td>80,871</td>
<td>92,186</td>
<td>11,315</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(7,563)</td>
</tr>
<tr>
<td>Avg. resident age</td>
<td>33.01</td>
<td>34.95</td>
<td>1.94***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.52)</td>
</tr>
<tr>
<td>Household size</td>
<td>5.11</td>
<td>5.32</td>
<td>0.20*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.12)</td>
</tr>
<tr>
<td>Community size</td>
<td>3,495</td>
<td>3,059</td>
<td>436.32***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(125.25)</td>
</tr>
</tbody>
</table>

Table E.2: **Descriptive Statistics**

<table>
<thead>
<tr>
<th>Neighbourhood Status at Time of Formation</th>
<th>Illegal</th>
<th>Legal</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope of terrain</td>
<td>0.225</td>
<td>0.141</td>
<td>0.084***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.020)</td>
</tr>
<tr>
<td>Latitude distance</td>
<td>0.083</td>
<td>0.060</td>
<td>0.023***</td>
</tr>
<tr>
<td></td>
<td>(≈ 15.4 km)</td>
<td>(≈ 11.1 km)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>N</td>
<td>73</td>
<td>255</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presence of a Housing Cooperative</th>
<th>Yes</th>
<th>No</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope of terrain</td>
<td>0.195</td>
<td>0.146</td>
<td>0.049***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.003)</td>
</tr>
<tr>
<td>Latitude distance</td>
<td>0.079</td>
<td>0.053</td>
<td>0.026***</td>
</tr>
<tr>
<td></td>
<td>(≈ 14.6 km)</td>
<td>(≈ 9.8 km)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>N</td>
<td>7</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

The geographic characteristics of neighbourhoods are collected from various maps and atlases of Quito.
Table E.3: Baseline Results - IV Estimation

<table>
<thead>
<tr>
<th></th>
<th>Second Stage</th>
<th>Time Contributions to Trash Collection (Hours/Month)</th>
<th>Time Contributions to Community Patrolling (Hours/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing cooperative</td>
<td>5.36***</td>
<td>7.11***</td>
<td></td>
</tr>
<tr>
<td>(Yes = 1, No = 0)</td>
<td>(2.10)</td>
<td>(1.77)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>First Stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing Cooperative</td>
<td>1.54***</td>
<td>1.34***</td>
<td></td>
</tr>
<tr>
<td>Slope of terrain</td>
<td>(0.11)</td>
<td>(0.11)</td>
<td></td>
</tr>
<tr>
<td>Distance from Centre</td>
<td>5.64***</td>
<td>4.19***</td>
<td></td>
</tr>
<tr>
<td>(North-South Axis)</td>
<td>(0.31)</td>
<td>(0.32)</td>
<td></td>
</tr>
<tr>
<td>F-test (first stage)</td>
<td>432.15</td>
<td>338.17</td>
<td></td>
</tr>
<tr>
<td>Sargan test (p-value)</td>
<td>0.2389</td>
<td>0.4585</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>388</td>
<td>396</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. 
Table E.4: Baseline Results IV: Second Stage

<table>
<thead>
<tr>
<th></th>
<th>Time Contributions to Trash Collection (Hours/Month)</th>
<th>Time Contributions to Community Patrolling (Hours/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperative</td>
<td>5.36***</td>
<td>7.11***</td>
</tr>
<tr>
<td>(Yes = 1, No = 0)</td>
<td>(2.10)</td>
<td>(1.77)</td>
</tr>
<tr>
<td>History of title holder</td>
<td>-0.014***</td>
<td>0.0035</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.0023)</td>
</tr>
<tr>
<td>log(Labour income)</td>
<td>-1.53**</td>
<td>0.75***</td>
</tr>
<tr>
<td></td>
<td>(0.52)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>Household size</td>
<td>0.08</td>
<td>0.54***</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>Avg. household age</td>
<td>0.23***</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>ln(Population)</td>
<td>-3.48***</td>
<td>-1.94***</td>
</tr>
<tr>
<td></td>
<td>(0.66)</td>
<td>(0.66)</td>
</tr>
<tr>
<td>Plot size inequality (stdev)</td>
<td>8.18</td>
<td>-4.86</td>
</tr>
<tr>
<td></td>
<td>(5.39)</td>
<td>(3.04)</td>
</tr>
<tr>
<td>Uncollected trash</td>
<td>-1.35</td>
<td></td>
</tr>
<tr>
<td>(by government)</td>
<td>(8.52)</td>
<td></td>
</tr>
<tr>
<td>Access to gov’t collection</td>
<td>8.76***</td>
<td></td>
</tr>
<tr>
<td>(Yes = 1, No = 0)</td>
<td>(1.42)</td>
<td></td>
</tr>
<tr>
<td>Break-ins (binary)</td>
<td></td>
<td>0.91</td>
</tr>
<tr>
<td>(per 1000 residents)</td>
<td></td>
<td>(0.95)</td>
</tr>
<tr>
<td>Murder rate</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10. Standard errors are reported in parentheses.
Table E.5: Baseline Results - Robustness Checks

<table>
<thead>
<tr>
<th>Panel A</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>Cooperative</td>
<td>7.82***</td>
<td>5.90***</td>
<td>5.02***</td>
<td>6.12***</td>
<td>5.36***</td>
<td>7.44***</td>
</tr>
<tr>
<td>(Yes = 1, No = 0)</td>
<td>(2.47)</td>
<td>(1.14)</td>
<td>(2.52)</td>
<td>(1.18)</td>
<td>(2.10)</td>
<td>(1.18)</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Controls</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>388</td>
<td>388</td>
<td>388</td>
<td>388</td>
<td>388</td>
<td>388</td>
</tr>
<tr>
<td>Estimation</td>
<td>2SLS</td>
<td>OLS</td>
<td>2SLS</td>
<td>OLS</td>
<td>2SLS</td>
<td>OLS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B</th>
<th>Robustness Tests (2SLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sargan test (p-value)</td>
</tr>
<tr>
<td></td>
<td>$\chi^2$ test (p-value)</td>
</tr>
<tr>
<td></td>
<td>F-test (1st stage)</td>
</tr>
<tr>
<td></td>
<td>Adjusted $R^2$</td>
</tr>
<tr>
<td></td>
<td>Partial $R^2$</td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.

In Panel A, the 2SLS results are compared against OLS. In Panel B, several 2SLS post-estimation results are reported, including the p-values for two overidentification tests (Sargan test and $\chi^2$ test). The Sargan test suggests that there were at least some strategic considerations.
Table E.6: Baseline Results - Robustness Checks 2

<table>
<thead>
<tr>
<th>Panel A</th>
<th>Time Contributions to Community Patrolling (Hours/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Cooperative</td>
<td>8.33***</td>
</tr>
<tr>
<td>(Yes = 1, No = 0)</td>
<td>(1.98)</td>
</tr>
<tr>
<td>Controls</td>
<td>No</td>
</tr>
<tr>
<td>N</td>
<td>396</td>
</tr>
<tr>
<td>Estimation</td>
<td>2SLS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B</th>
<th>Robustness Tests (2SLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sargan test (p-value)</td>
<td>0.7083</td>
</tr>
<tr>
<td>$\chi^2$ test (p-value)</td>
<td>0.0245</td>
</tr>
<tr>
<td>F-test (1st stage)</td>
<td>186.97</td>
</tr>
<tr>
<td>$R^2$</td>
<td>19.33 %</td>
</tr>
<tr>
<td>Partial $R^2$</td>
<td>19.33 %</td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.
In Panel A, the 2SLS results are compared against OLS. In Panel B, several 2SLS post-estimation results are reported, including the p-values for two overidentification tests (Sargan test and $\chi^2$ test). The Sargan test suggests that there were at least some strategic considerations.
Table E.7: Relationship between Contributions to Maintaining vs. Use of Public Areas

<table>
<thead>
<tr>
<th>Avg contributions</th>
<th>Binary: Yes = 1, No = 0</th>
<th>Total Hours Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>0.146***</td>
<td>0.140***</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.042)</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Controls</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>N</td>
<td>388</td>
<td>388</td>
</tr>
<tr>
<td>Estimation</td>
<td>Probit</td>
<td>Probit</td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The coefficient in column (1) indicates the following relationship: the second 5 hrs. contributed to trash collection are associated with 19% more households using public areas for recreational purposes.

Table E.8: Robustness Check: Inherent Differences over Maintaining Areas Clean

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time spent collecting trash on own property (per household member/past month)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Cooperative (Yes = 1, No = 0)</td>
<td>-10.39**</td>
</tr>
<tr>
<td></td>
<td>(4.58)</td>
</tr>
<tr>
<td>Controls</td>
<td>No</td>
</tr>
<tr>
<td>Fixed effects</td>
<td>No</td>
</tr>
<tr>
<td>N</td>
<td>396</td>
</tr>
<tr>
<td>Estimation</td>
<td>OLS</td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors reported in parentheses.
Table E.9: Presence of a Neighbourhood Organization (Housing Cooperative)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Housing Cooperative (Yes = 1, No = 0)</th>
<th>Illegal Settlement (Yes = 1, No = 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope of terrain</td>
<td>3.552*** (0.320)</td>
<td>2.388*** (0.519)</td>
</tr>
<tr>
<td>Distance from Centre (North-South Axis)</td>
<td>10.08*** (0.92)</td>
<td>9.80*** (2.11)</td>
</tr>
<tr>
<td>Estimation Data</td>
<td>Probit</td>
<td>Probit</td>
</tr>
<tr>
<td>Data</td>
<td>In Sample</td>
<td>Out of Sample</td>
</tr>
<tr>
<td>$R^2$</td>
<td>9.26 %</td>
<td>11.41 %</td>
</tr>
<tr>
<td>N</td>
<td>20</td>
<td>332</td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are reported in parentheses.

The coefficients from the Probit regression (left column) imply the following relationships: a 10 degree increase in slope is associated with 26% higher probability of observing a housing cooperative (illegal settlement) and, similarly, the 5-km equivalent of latitude distance with a 22% higher probability.

Table E.10: Gradual vs. Non-gradual Expansion of Quito (on elongated North-South Axis)

<table>
<thead>
<tr>
<th>Age of community</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighbourhood type (at time of formation)</td>
<td>All Legal Illegal All Legal Illegal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimation</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
</tr>
<tr>
<td>N</td>
<td>328</td>
<td>255</td>
<td>73</td>
<td>263</td>
<td>192</td>
<td>71</td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are reported in parentheses.
Table E.11: Availability of Rugged/Flat Land over Time

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of community</td>
<td>0.012</td>
<td>-0.001</td>
<td>0.035</td>
<td>0.000</td>
<td>0.036</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>(0.176)</td>
<td>(0.176)</td>
<td>(0.026)</td>
<td>(0.001)</td>
<td>(0.025)</td>
<td>(0.020)</td>
</tr>
<tr>
<td>Neighbourhood type</td>
<td>All</td>
<td>Legal</td>
<td>Illegal</td>
<td>All</td>
<td>Legal</td>
<td>Illegal</td>
</tr>
<tr>
<td>(at time of formation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimation</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
</tr>
<tr>
<td>N</td>
<td>328</td>
<td>255</td>
<td>73</td>
<td>263</td>
<td>192</td>
<td>71</td>
</tr>
</tbody>
</table>

Notes: Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are reported in parentheses.
Appendix F

Chapter 4: Proof of Proposition 4

For status quo policy $\tau_{sq} \in [0, \hat{\tau}]$, I analyze the political equilibria associated with the occupational distribution $\Gamma(1 - 2\alpha, \alpha, \alpha)$ and $\Gamma(1, 0, 0)$.

The occupational shares imply no political party has the majority and political parties need to engage in coalition formation to have any amendment to the status quo policy passed in the legislature. I proceed by first analyzing the amendment stage and subsequently initial stage as the model is solved by backward induction.

**Amendment stage:**

Suppose that $PS$ has the proposal power.

Range of $\tau$ for which $U_{PS}(\tau) \geq U_{PS}(\tau_{sq}) : \tau_{sq}$. This is because $U_{PS}(\tau)$ is strictly increasing in $\tau \in [0, \tau_{sq}]$, while $a^S(\tau) = 1 - 2\alpha$ is constant for any $\tau \in [0, \tau_{sq}]$. $PS$’s utility is maximized at $\tau_{sq}$, the highest theft rate value in the permissible range.

The coalition formation in this instance is trivial since $PS$ has no incentive to propose a theft rate different from the default value. $PS$ proposes $\tau_{sq}$, which is supported by: $c = \{PW, PE\}$ as each of them are indifferent between the proposed $\tau_{sq}$ and the default $\tau_{eq}$.

Proposed policy: $\tau = \tau_{sq}$; passed. MWC: $\{PS, PW, PE\}$.

Suppose that $PW$ has the proposal power.

Range of $\tau$ for which $U_{PW}(\tau) \geq U_{PW}(\tau_{sq}) : \tau_{sq}$. This is because $U_{PW}(\tau)$ is strictly increasing in $\tau \in [0, \tau_{sq}]$, while $a^W(\tau) = \alpha$ is constant for any $\tau \in [0, \tau_{sq}]$. $PW$’s utility is maximized at $\tau_{sq}$, the highest theft rate value in the permissible range.

The coalition formation in this instance is trivial since $PW$ has no incentive to propose
a theft rate different from the default value. PW proposes \( \tau^{sq} \), which is supported by: 
\[ c = \{PS, PE\} \] as each of them are indifferent between the proposed \( \tau^{sq} \) and the default \( \tau^{sq} \).

Proposed policy: \( \tau = \tau^{sq} \); passed. MWC: \( \{PW, PS, PE\}\).

**Suppose that PE has the proposal power.**

The range of \( \tau \), for which \( U^{PE}(\tau) \geq U^{PE}(\tau^{sq}) \), is \( \tau \in [0, \tau^{sq}] \) with a global maximum value attained at \( \tau_1 = 0 \). This is because \( U^{PE}(\tau) \) is strictly decreasing in \( \tau \in [0, \tau^{sq}] \), while \( a^E(\tau) = \alpha \) is constant for any \( \tau \in [0, \tau^{sq}] \). These properties of the utility function lead to a corner solution where PE’s utility is maximized at \( \tau = 0 \), the lowest theft rate value in the permissible range.

Next, PE is seeking a coalition partner from the other two political parties in the legislature and will select the one that is cheaper to buy. I have already established that, for \( \tau^{sq} \in [0, \hat{\tau}] \), the range of \( \tau \) for which \( U^{PS}(\tau) \geq U^{PS}(\tau^{sq}) \) is the value of \( \tau^{sq} \) only and that the range of \( \tau \) for which \( U^{PW}(\tau) \geq U^{PW}(\tau^{sq}) \) is also the value of \( \tau^{sq} \) only. The complete overlap in the permissible range implies \( PS \) and \( PW \) are equally cheap to buy for \( PE \).

This implies \( PE \) proposes \( \tau^{sq} \), the only theft rate value that satisfies its participation constraint and for which it would receive the backing of at least one coalition partner. The proposed theft rate is supported by: \( c = \{PS, PE\} \) (both are equally expensive to buy) as they are indifferent between the proposed \( (\tau^{sq}) \) and the default \( (\tau^{sq}) \) policies.

Proposed policy: \( \tau = \tau^{sq} \); passed. MWC: \( \{PE, PS, PW\}\).

**Initial proposal stage:**

Next, I show the participation constraints for each of the political parties are identical to their respective ones in the amendment stage. Once this result is established, I will show that each political party faces the exact same problem as in the amendment stage.

First, I show \( PS \) is facing the same constraint as in the amendment stage.

\[
a_1^S y_1^S(\tau) + a_2^S(\tau)y_2^S(\tau) \geq \frac{a^W}{a^W + a^E} U^{PS}(\tau|N^{AS} = PW) + \frac{a^E}{a^W + a^E} U^{PS}(\tau|N^{AS} = PE) \tag{F.1}
\]

Consider the RHS of \( PS \)'s participation constraint:

\[
\mathbb{E} U^{PS}(\tau) = \frac{a^W}{a^W + a^E} U^{PS}(\tau|N^{AS} = PW) + \frac{a^E}{a^W + a^E} U^{PS}(\tau|N^{AS} = PE) \quad \tag{F.2}
\]
I use the following facts: $\frac{a^W}{a^W + a^E} = \frac{a^E}{a^W + a^E} = \frac{\alpha}{\alpha + \hat{a}} = \frac{1}{2}$ for $\tau \in [0, \tau^{sq}]$; and $\tau|(N^{AS} = PW) = \tau|(N^{AS} = PE) = \tau^{sq}$.

$$\mathbb{E} U^S(\tau) = \frac{1}{2}\{a^S_1 y^S_1(\tau^{sq}) + a^S_2(\tau^{sq})y^S_2(\tau^{sq})\} + \frac{1}{2}\{a^S_1 y^S_1(\tau^{sq}) + a^S_2(\tau^{sq})y^S_2(\tau^{sq})\} \quad (F.3)$$

The above equation also indicates the occupational choice and economic decisions in the second period if $\tau = \tau^{sq} \in [0, \hat{\tau}]$ were implemented as the equilibrium policy in period 1.

$$\mathbb{E} U^S(\tau) = a^S_1 y^S_1(\tau^{sq}) + a^S_2(\tau^{sq})y^S_2(\tau^{sq}) \quad (F.4)$$

I also make use of the fact $a_1 = a_2^S(\tau) = a_2^S(\tau^{sq}) = 1 - 2\alpha$ for any $\tau \in [0, \tau^{sq}]$. This implies $PS$’s participation constraint it faces in the initial stage is identical to the one $PS$ faces in the amendment stage:

$$U^S(\tau) = (1 - 2\alpha)(y^S_1(\tau) + y^S_2(\tau)) \geq (1 - 2\alpha)(y^S_1(\tau) + y^S_2(\tau)) = \mathbb{E} U^S(\tau) \quad (F.5)$$

Next, I establish the same result for $PW$’s participation constraint.

$$a^W_1 y^W_1(\tau) + a^W_2(\tau)y^W_2(\tau) \geq \frac{a^W}{a^W + a^E}U^{PW}(\tau|N^{AS} = PW) + \frac{a^E}{a^W + a^E}U^{PW}(\tau|N^{AS} = PE) \quad (F.6)$$

Consider the RHS of $PW$’s participation constraint:

$$\mathbb{E} U^{PW}(\tau) = \frac{a^W}{a^W + a^E}U^{PW}(\tau|N^{AS} = PW) + \frac{a^E}{a^W + a^E}U^{PW}(\tau|N^{AS} = PE) \quad (F.7)$$

I make use of the following facts: $\frac{a^W}{a^W + a^E} = \frac{a^E}{a^W + a^E} = \frac{\alpha}{\alpha + \hat{a}} = \frac{1}{2}$ for $\tau \in [0, \tau^{sq}]$; and $\tau|(N^{AS} = PW) = \tau|(N^{AS} = PE) = \tau^{sq}$.

$$\mathbb{E} U^{PW}(\tau) = \frac{1}{2}\{a^W_1 y^W_1(\tau^{sq}) + a^W_2(\tau^{sq})y^W_2(\tau^{sq})\} + \frac{1}{2}\{a^W_1 y^W_1(\tau^{sq}) + a^W_2(\tau^{sq})y^W_2(\tau^{sq})\} \quad (F.8)$$
I also make use of the fact $a_1^W = a_2^W (\tau) = a_2^W (\tau^{sq}) = \alpha$ for any $\tau \in [0, \tau^{sq}]$. This implies $PW$’s participation constraint it faces in the initial stage is identical to the one $PW$ faces in the amendment stage:

$$U^{PW}(\tau) = \alpha(y_1^W(\tau) + y_2^W(\tau)) \geq \alpha(y_1^W(\tau) + y_2^W(\tau)) = \mathbb{E} U^{PW}(\tau) \quad (F.10)$$

Last, I establish the same result for $PE$’s participation constraint.

$$U^{PE}(\tau) = \alpha(y_1^E(\tau) + y_2^E(\tau)) \geq \alpha(y_1^E(\tau) + y_2^E(\tau)) = \mathbb{E} U^{PE}(\tau) \quad (F.15)$$

Once it is established each constraint in the amendment stage is identical to its correspondent constraint in the initial stage, it is trivial to determine that the solution to each
problem faced in the initial stage is identical to its correspondent solution to its correspond-
ing problem in the amendment stage. The solution for each political party being assigned
the proposal power is summarized as follows:

**Suppose that PS has the proposal power.**
Proposed policy: $\tau = \tau^{sq}$; passed. MWC: \{PS, PW, PE\}

**Suppose that PW has the proposal power.**
Proposed policy: $\tau = \tau^{sq}$; passed. MWC: \{PW, PS, PE\}

**Suppose PE has the proposal power.**
Proposed policy: $\tau = \tau^{sq}$; passed. MWC: \{PE, PS, PW\}